Navigating the Textile and Readymade Garments Sector Towards Green Transition

The Experience in Bangladesh

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Centre for Policy Dialogue (CPD)

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EXECUTIVE SUMMARY

1. The export-oriented textile and readymade garments (RMG) sector is an important driving force of Bangladesh's economy, generating employment and foreign exchange. In the fiscal year (FY) 2023-24, the RMG industry alone generated USD 36.13 billion, accounting for 81.23 per cent of total export earnings and 7.87 per cent of the country's GDP. Currently, more than 3.46 million people are employed in the RMG industry and the female employment ratio in the industry is 39.06 per cent, according to the 2022 Labour Force Survey (LFS) of the Bangladesh Bureau of Statistics (BBS). The two major Bangladeshi RMG products export destinations are the European Union (EU) countries and the United States of America (USA). In FY2024, the total RMG export to the major EU countries was USD 13.62 billion, which was 37.69 per cent of the total RMG export of the country. The RMG export to the USA was USD 6.62 billion in FY2024, which was 18.32 per cent of the total RMG export.

2. In view of Bangladesh's graduation from the category of Least Developed Country (LDC) to a developing country in 2026, the textile and RMG sector of the country will need to have a clear strategy for accomplishing environmental and sustainability commitments in areas such as clean energy, carbon neutrality, waste management, robust climate actions vis-à-vis the emerging EU Green Deal, and circular economy frameworks. Against this backdrop, the present study has examined the state of green transition initiatives in Bangladesh's textile and RMG sector, the associated challenges and the way forward based on evidence collected from primary sources.

3. The study used a mixed approach involving quantitative and qualitative tools and techniques. A primary survey was conducted among the owners, managers, workers, and supervisors of 403 factories in the textile and RMG sector between June and November 2022. Additionally, 4,541 workers and supervisors were interviewed from the aforementioned factories to collect information regarding workers' knowledge and perception of green practices and the impact of green practices on the workers' health and productivity. Samples were selected following the Simple Random Sampling (SRS) method. Of the surveyed factories, 182 were RMG, while 221 were textile. The study conducted a number of key informant interviews (KIIs) and focus group discussions (FGDs) to elicit information and insights from sector stakeholders and obtain an in-depth understanding of challenges pertaining to green transition. FGDs were organised in factories in the Dhaka and Chattogram districts of Bangladesh. Participants of the FGDs included factory owners, senior managers, sustainability managers, environmental officers, factory workers and supervisors, and industry experts. Two expert group meetings (EGMs) were organised to validate the study findings and receive feedback. Additionally, two national dialogues were organised to solicit insights from the stakeholders, including the exporters, the brands and buyers, government policymakers, experts, and development partners.

4. Among the surveyed factories, 20.60 per cent are large, 21.09 per cent are small and medium, and 58.31 per cent are micro in size. Among the 83 large factories surveyed, 31.33 per cent have received green certification from LEED, and 15.66 per cent of the factories have applied for green certification. In contrast, 53.01 per cent of the large factories in the sample do not have green certification. The key reasons for obtaining such certificates include self-motivation, buyer requirements, and competitiveness in global markets. The study finds that access to information, resources for certification, and overall capacity to adopt environmentally compliant practices are important factors that play a crucial role in awareness and knowledge about green certificates. Hence, large factories are more aware of greening than micro, small and medium-sized factories.

5. Understandably, the amount of green investment varies across the size of factories. In the case of large factories, the amount of green investment during the last five years was Bangladeshi Taka (BDT) 78.07 million (USD

0.710 million) on average per factory, which is 36.98 per cent of their total investment per year. The small and medium factories invested BDT 1.37 million (USD 0.012 million) per factory on average for greening their factories during the last five years. The average per factory investment by the micro factories was BDT 0.16 million (USD 0.001 million). The factories invested in energy, water, air, and waste management.

6. The consumption patterns of utility reveal differences across the size of factories. The smaller factories rely more on grid electricity than large factories due to their limited capacity. While small and medium factories and micro factories use 86.59 per cent and 93.35 per cent of their total electricity from a grid connection, respectively, and large factories only use 65.12 per cent.

7. Workers in large factories demonstrate higher productivity and lower sickness-related absenteeism rates than workers in smaller factories. The sickness related absence rate in the month before the survey was 49.76 per cent for large factories. The corresponding figures for small and medium and micro factories were 61.49 per cent and 53.26 per cent, respectively. 99.57 per cent of workers in large factories believe that green practices benefit them by implementing improved air quality, reduced noise pollution, and sustainable practices. This leads to a more pleasant and productive work environment and reduced absenteeism and turnover rates.

8. The study finds four significant types of barriers that the textile and RMG factories face in green transitioning: policy and regulatory barriers, institutional barriers, factory-level barriers, and market-related barriers. The policy barriers include a lack of harmonisation in policies and regulations, an absence of specific environmental goals in policies and regulatory frameworks, and regulatory and policy uncertainty for energy security. The institutional barriers identified are weak regulatory, management, monitoring systems, and enforcement, and a lack of coordination among government agencies. The key factory-level barriers to green transition include lack of awareness, limited technological capacity, limited access to finance, and limited use of water and electricity from sustainable sources. Lastly, the market-related barriers to green transition are a lack of market-driven incentives and a lack of information and expertise on green technologies.

9. In view of the analyses based on the primary data collected from the survey, KIIs, and FGDs, this study makes a number of recommendations for securing green transition in the textile and RMG sector in Bangladesh. These recommendations have been clustered under five broad themes: policy and regulatory measures, economic incentives, green finance, awareness and knowledge sharing, and skills and capacity development.

10. Securing a green transition in the textile and RMG sector requires considerable effort in the policy domain. Given the issue's multidimensional nature and the number and types of stakeholders involved, effective coordination among these players is critical.

11. Economic incentives should be provided to factories currently investing in and willing to invest in promoting green measures, technological development, productivity enhancement, skill development, and higher worker welfare. Besides, premium prices are expected to encourage more factories to engage in greening initiatives. Such a measure will incentivise the factories to compensate for the huge initial investment required for greening the factories.

12. The study recommends ensuring easy access to green finance through mechanisms like soft loans, grants, and seed funds.

13. The relevant government departments and industry associations should disseminate information on the availability of funds. All textile and RMG sector factories should have access to information on greening their outlets. Awareness of the meaning and implications of greening and ways to be green is needed. Information on green transition should be readily available to owners, officials, workers, and trade union members.

14. Special training and workshops should be provided for factories, particularly small and medium enterprises, to raise their awareness and encourage them to undertake green measures. Women's participation in such training must be ensured. These can be organised by industry associations with support from academia and think tanks and funded by buyers and international development partners. Hence, government agencies, including the National Skills Development Authority (NSDA) and the Ministry of Industries (MoI), can coordinate.

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The Study Team would like to acknowledge the support received from several agencies concerned which have helped by sharing relevant documents and data. In this connection, the Team would like to thank Bangladesh Garment Manufacturers and Exporters Association (BGMEA), Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA), and Bangladesh Textile Mills Association (BTMA) for their cooperation. The Team would also like to register its sincere gratitude to the authorities of the factories visited by the CPD Study Team and surveyors during the survey and field visits. The authors of the study also acknowledge the support of Org-Quest Research Limited for conducting the survey.

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The Study Team gratefully acknowledges the useful comments offered by representatives of various stakeholder groups and experts who participated in the national dialogue titled 'Securing Green Transition of the Textile and

Readymade Garments Sector in Bangladesh' on 3 October 2023. In this regard, the authors would like to show their deep appreciation of the valuable inputs provided by the Chief Guest of the dialogue *Dr Shamsul Alam*, former State Minister, Ministry of Planning, Government of Bangladesh. The Team thanks the following panellists for their insightful comments and suggestions offered at the dialogue: *H E Ms Alexandra Berg Von Linde*, Ambassador of Sweden to Bangladesh; *H E Mr Charles Whiteley*, Ambassador, Head of Delegation, Delegation of the European Union to Bangladesh; *Mr Thijs Woudstra*, Deputy Head of Mission, Embassy of the Kingdom of the Netherlands in Bangladesh; and *Mr Md Shahidullah Azim*, Vice President, BGMEA.

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ACRONYMS

8FYP	Eighth Five-Year Plan
BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistics
BCI	Better Cotton Initiative
BDT	Bangladeshi Taka
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BIWTA	Bangladesh Inland Water Transport Authority
BSCI	Business Social Compliance Initiatives
BTMA	Bangladesh Textile Mills Association
DFQF	Duty Free Quota Free
DNCC	Dhaka North City Corporation
DoE	Department of Environment
EBA	Everything but Arms
ECA	Environmental Conservation Act
EGMs	Expert Group Meetings
EPB	Export Promotion Bureau
EPZs	Export Processing Zones
ETP	Effluent Treatment Plant
FGDs	Focus Group Discussions
FY	Fiscal Year
GDP	Gross Domestic Product
GED	General Economics Division
GHG	Greenhouse Gas
GoB	Government of Bangladesh
GOTS	Global Organic Textile Standard
GSP	Generalised Scheme of Preference
ILO	International Labour Organization
IT	Information Technology

KIIs	Key Informant Interviews
LDC	Least Developed Country
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
CPP	Climate Prosperity Plan
MoC	Ministry of Commerce
MoEFCC	Ministry of Environment Forest and Climate Change
MoF	Ministry of Finance
MoI	Ministry of Industries
MoIB	Ministry of Information and Broadcasting
MoP	Ministry of Planning
MoPEMR	Ministry of Power, Energy and Mineral Resources
NSDA	National Skills Development Authority
OCS	Organic Content Standard
OECD	Organization for Economic Co-operation and Development
PMO	Prime Minister's Office
RECP	Resource Efficiency and Cleaner Production
RMG	Readymade Garments
SMEs	Small and Medium Enterprises
SMI	Survey of Manufacturing Industries
SREDA	Sustainable and Renewable Energy Development Authority
SRS	Simple Random Sampling
UNIDO	United Nations Industrial Development Organization
USA	United States of America
USD	United States Dollar

1. CONTEXT

Green economic transition is crucial for sustainable economic growth. Following the Paris Climate Agreement in 2015, there is an increasingly higher demand for environmentally friendly production and consumption by companies. In the run-up to the 26th Conference of Parties (COP26) of the United Nations Framework Conventions on Climate Change (UNFCCC) and following the publication of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in August 2021 (IPCC, 2021), the urgency for working towards tackling climate change is being pronounced even more loudly. It is also now clear that the problem cannot be solved by the governments alone due to the enormity of measures and resources needed. All stakeholders have to play their part. Particularly, the private sector has to play the most important role in mitigating the challenges of climate change by being energy efficient and cleaning the wastes generated by the sector. Worldwide, large companies have announced their targets for reducing carbon dioxide (CO_2) emissions by around the middle of the century. They are making considerable investments to fulfil their goals. However, companies in the least developed and developing countries lag behind in making similar commitments and investments due to technological, financial and capacity constraints.

Bangladesh is one of the most vulnerable countries that severely bear the brunt of climate change. Additionally, environmental degradation is also a huge problem for the country. At times, economic development is achieved at the cost of the environment. Exhaustion of natural resources, degradation of the environment and rampant pollution are hazardous to public health and pose challenges to sustainable economic growth. While the country has made commendable improvements in its natural disaster management efforts, the need to address environmental and climate-related concerns as an integral part of the development discourse can no longer be ignored.

The export-oriented textile and readymade garments (RMG) sector is an important driving force of the economy of Bangladesh as it is a source of employment generation and foreign exchange. Within this entire sector, RMG alone earned USD 36.13 billion in fiscal year 2023-24 (FY2024). This was 81.23 per cent of the total export earnings in that year and 7.87 per cent of the

country's total gross domestic product (GDP) (Bangladesh Bank, 2024). The two major Bangladeshi RMG products export destinations are the European Union (EU) countries and the United States of America (USA). In FY2024, the total RMG export to the major EU countries was USD 13.62 billion, which was 37.69 per cent of the total RMG export of the country. The RMG export to the USA was USD 6.62 billion in FY2024, which was 18.32 per cent of the total RMG export. As a least developed country (LDC), Bangladesh has been enjoying duty-free quota-free (DFQF) market access under the Generalised Scheme of Preference (GSP) as part of the EU's Everything But Arms (EBA) initiative.

With over 5,500 factories, the textile and RMG sector, employ 4.5 million people (MiB, 2023; BTMA, 2022). The sector plays a critical role in women's economic empowerment since the share of women workers is 57.2 per cent of the total employment in the RMG industry (MiB, 2023), albeit lower than the peak figure when women constituted a 80 per cent share (Shajahan et al., 2020). As an export-oriented industry, the textile and RMG sector must comply with international labour laws, safety standards in working conditions and environmental requirements to remain competitive and meet the evolving standards of global brands.

Following Bangladesh's graduation from the LDC category to a developing country in 2026, the country will lose preferential access to the EU and other developed and developing country markets for its RMG exports. As a developing country, Bangladesh can avail market access through the GSP scheme upon fulfilling several compliance-related criteria. Bangladesh must work towards ratification and stringent enforcement of all 27 core labour conventions of the International Labour Organization (ILO). The Government of Bangladesh (GoB) and the textile and RMG sector also need to have a clear strategy for accomplishing environmental and sustainability commitments in areas such as clean energy, carbon neutrality, waste management, robust climate actions

vis-à-vis the emerging EU Green Deal[1], and circular economy frameworks[2]. Following the Paris Climate Agreement in 2015 and net-zero commitments of countries by the middle of the century at COP26, there is higher and more stringent demand for environment and climate-friendly production in all sectors and businesses. Given the enormity of the tasks involved in achieving climate goals, collaborative efforts that involve all stakeholders, such as entrepreneurs, buyers, and the government, are needed.

Though the current level of its greenhouse gas (GHG) emission is insignificant, which is only 0.47 per cent of the global total as per the updated data of 2021 (Climatewatch, 2024), Bangladesh's commitment through Intended Nationally Determined Contribution (INDC) towards low-carbon growth and various programmes shows its determination to pursue low-carbon intensive growth. Bangladesh has made a voluntary commitment—Nationally Determined Contributions (NDCs)—under the Paris Agreement to reduce its emissions in a number of sectors. It has submitted its INDC to the UNFCCC in 2015 and revised it in 2021. Initially, the country has committed to reducing GHG emissions in three sectors including power, industry and transport sectors, with an ambitious GHG reduction target of 15 per cent from a 'Business as Usual' level by 2030. Of this, a five (5) per cent reduction was targeted as unconditional, and 10 per cent was as conditional, which is contingent upon technical and financial support from the global community (MoEF, 2015). In its revised NDC, Bangladesh has committed to reducing GHG emissions by 6.73 per cent by 2030 in five sectors, namely, power, transport, industry, waste and land use. With additional finance and technology from external sources, Bangladesh will reduce GHG emissions by 15.12 per cent (MoEF, 2021). The textile and RMG industry is one of the most resource-

[1]The European Green Deal is a set of policy initiatives that aims towards achieving green transition in the region and ultimately attaining climate neutrality by 2050. The policy initiatives include those related to the climate, the environment, energy, transport, industry, agriculture, and sustainable finance. All of these, in turn, are strongly interrelated.

[2]The circular economy framework focuses on decoupling economic growth from resource use and shifting to circular systems in production and consumption. In March 2020, the European Commission presented a new circular economy action plan which envisages over 30 action points on designing of sustainable products, circularity in production processes and empowering consumers and public buyers. It targets sectors such as electronics and ICT, batteries, packaging, plastics, textiles, construction and buildings, and food.

intensive sectors. Therefore, it has the potential to contribute to achieving its commitments to reduce GHG emissions.

The main association of the sector, Bangladesh Garments Manufacturers and Exporters Association (BGMEA) has joined the UN Climate Charter and supported the country to become the home of several green RMG factories. As of 28 August 2024, 226 Bangladeshi RMG factories have achieved Leadership in Energy and Environmental Design (LEED) certification by the US Green Building Council. Indeed, out of the 100 top RMG factories in the world, 54 are from Bangladesh (BGMEA, 2024b). A LEED certificate requires factories to meet its 9 prerequisites—LEED building design and construction V4 (2015); integrative process - integrative planning process; location/transportation - infrastructural integration of the location; sustainable sites - sustainable location/ property qualities; water efficiency - water efficiency; energy and atmosphere - energy and global environmental impacts; materials and resources - material cycles and resource conservation; indoor environmental quality - indoor (air) quality and comfort; and innovation (USGBC, 2022). However, some brands and buyers have different criteria for factories to be green than the LEED certification. Therefore, textile and RMG exporters will have to work towards fulfilling those requirements.

In the above context, the present study has examined the state of green transition initiatives in the textile and RMG sector of Bangladesh based on evidence collected from primary sources. The objectives of the study are to (i) build nationwide factory-level evidence on the state of green practices in the textile and RMG sector; (ii) collect evidence on the type of barriers to and drivers of green transformation in the textile and RMG factories, and investigate if these are symmetric across all sizes of factories; (iii) explore factories' knowledge, interest, and capacity in adopting green transition initiatives; (iv) understand workers' awareness and perception on benefits of green practices; and (v) make a set of recommendations to overcome the challenges in making a green transformation of the textile and RMG sector of the country.

The rest of the report are organised as follows: section 2 discusses the analytical framework of the study; section 3 discusses data sources and methodology; section 4 discusses overview of the sector and national commitments; section

5 discusses brief survey of literature; section 6 discusses general information of factories surveyed; section 7 discusses green measures undertaken by factories; section 8 discusses social aspects of greening factories; section 9 discusses barriers for greening factories; and finally section 10 discusses conclusions and recommendations.

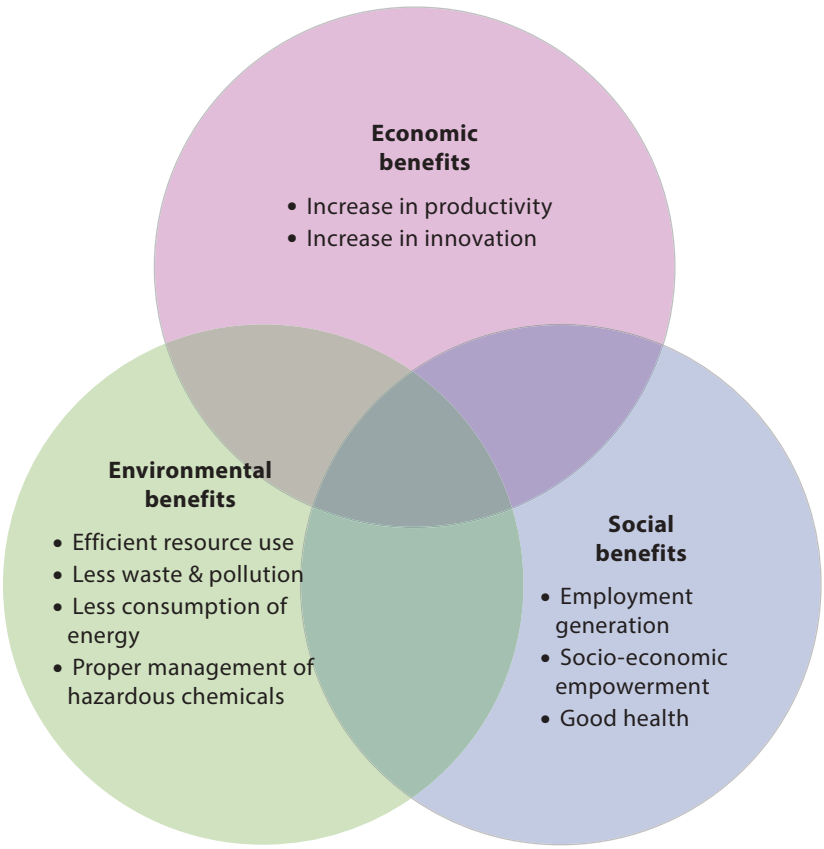
2. ANALYTICAL FRAMEWORK OF THE STUDY

In the parlance of green industrialisation, two concepts are used—greening of industries and green industries. Greening of industries refers to the commitment of industries to reduce the environmental impacts of their production processes and products. This is done through resource efficiency, environmentally sound management of chemicals, waste management, replacing fossil fuels with renewable energy and eco-design of products. Green industries are basically industries in the environmental goods and services sector. These industries manufacture clean technologies to achieve environmental objectives (UNIDO, 2010). While acknowledging this definition, the present study moves away from the traditional nomenclature and considers industries to be green if they have gone through the greening process.

The current study is about greening the industry. To elaborate, greening the industry means that industrial production and development do not come at the expense of the health of natural systems or lead to adverse human health outcomes. It includes the commitment to and action on reducing the environmental impacts of industrial processes and products by improving production efficiency, enhancing environmental performance, and minimising health risks (UNIDO, 2011). Green industrialisation is essential for achieving green growth which follows a path of economic growth by using natural resources in a sustainable manner. It implies fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which well-being relies (OECD, 2011). The perspective of this study, therefore, is to look at greening as a holistic process, where greening of industries will have benefits on three streams—economic, social, and environmental. This is illustrated in Figure 2.1 below.

Greening of industries requires appropriate policies in four broad areas: (i) pollution control; (ii) resource efficiency and cleaner production (RECP) that considers production efficiency, environmental management, and human development; (iii) energy management; and (iv) chemical and waste management. Figure 2.2 shows the components of greening industries. In order to implement these, various government policies are required.

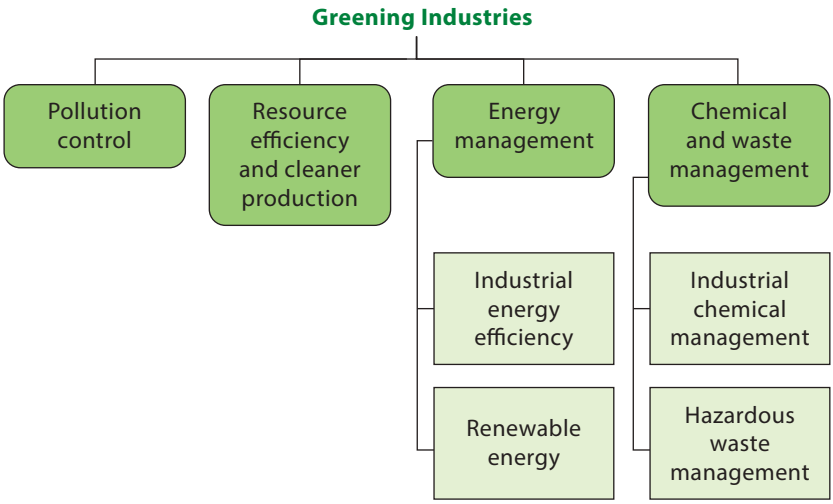
Figure 2.1: Holistic View of Greening Industries



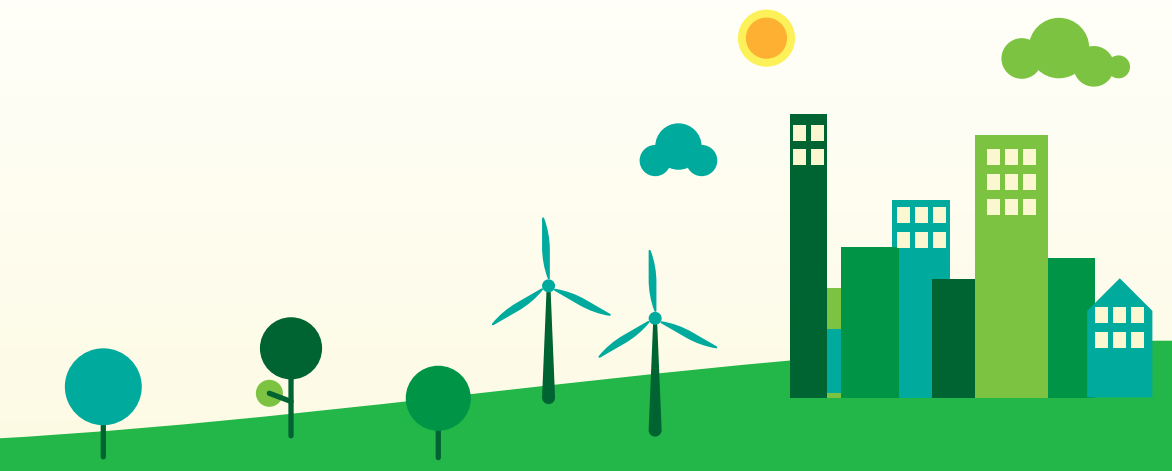
Source: Authors' illustration.

Following the above framework, this study presents key findings on initiatives taken by the factories, what more is needed, the challenges they face, and how those can be overcome.

Figure 2.2: Pathways to Greening of Industries



Source: Adapted from UNIDO (2011), and Luken and Clarence-Smith (2019).



3. DATA SOURCES AND METHODOLOGY

The study used a mixed approach involving both quantitative and qualitative tools and techniques. Four methods were employed as part of the methodology.

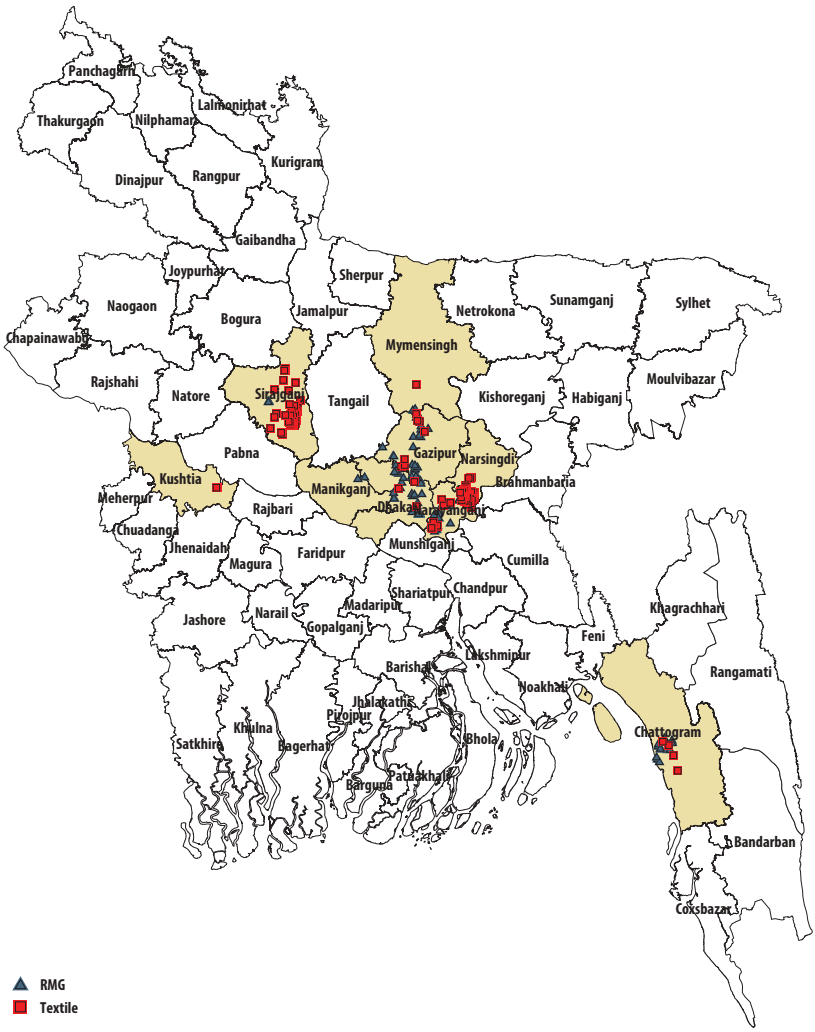
First, a primary survey was conducted among the owners, managers, workers, and supervisors of 403 factories in the textile and RMG sector between June and November 2022. Additionally, a total of 4,541 workers and supervisors were interviewed from the aforementioned factories. Samples were selected following the Simple Random Sampling (SRS) method. Of the surveyed factories, 182 were RMG factories, while 221 were textile factories. The samples were selected from a total of 5,532 textile and RMG factories. The selected factories are situated in 9 districts of Bangladesh (Figure 3.1). The survey followed the classification from the Survey of Manufacturing Industries (SMI) 2019 by the Bangladesh Bureau of Statistics (BBS), which categorises factories as follows: micro factories have 10-24 employees, small and medium factories have 25-249 employees, and large factories have 250 or more employees (BBS, 2020).

Second, the study conducted key informant interviews (KIIs) to elicit information and insights of stakeholders of the sector. Semi-structured KIIs were conducted with 120 factory owners and top managers. Six additional KIIs were conducted with industry insiders (owners, managers, sustainable officers, and green certification consultant, etc.) to obtain an in-depth understanding of barriers and challenges pertaining to green transition. Another four KIIs were conducted with brands and buyers to understand their motivations and initiatives.

Third, seven focus group discussions (FGDs) were organised in factories of Dhaka and Chattogram districts. Participants of the FGDs included factory owners, senior managers, sustainability managers, environmental officers, factory workers and supervisors, and industry experts.

Fourth, two additional expert group meetings (EGMs) were organised to validate the study findings and receive feedback. The participants of these EGMs included owners and officials of textile and RMG factories, and representatives from brands and buyers.

Figure 3.1: Survey Coverage



Source: Authors' illustration.

4. OVERVIEW OF THE SECTOR AND NATIONAL COMMITMENTS

4.1 Brief Overview of the Textile and RMG Sector

After the Independence of Bangladesh in 1971, many observers were pessimistic regarding the development prospects of the newly liberated country. Despite some longstanding structural challenges and emerging issues, it can be unequivocally claimed that the country has progressed a lot from there. Over a third portion of the Bangladesh economy is now connected with the global economy through export, import, factor and commodity markets. The degree of openness (i.e., share of the exports, imports and remittance in GDP) of Bangladesh economy stands at 31.71 per cent at the end of FY2023. The transformation from a predominantly aid receiving nation to a trading nation is quite evident. The export-oriented RMG and textile sector had a profound impact on the aforementioned transformation of the economy. The textile and RMG sector gradually replaced Bangladesh's jute and associated products sector as the major source of export earnings and eventually surpassed it by a significant margin (Adnan et al., 2015; Islam and Hoque, 2018). As the traditional export sector could not maintain an upward trajectory, the textile and RMG sector gradually stimulated the export as well as the domestic economy through backward and forward linkages.

The history of the RMG industry in Bangladesh can be traced back to the 1970s. During this era, the RMG industry consisted mostly of small tailoring outfits which were geared towards catering to domestic demand (Rasel, Das & Khan, 2020; Swazan & Das, 2022). One of these enterprises, Reaz Garments, started bulk production of woven shirts for export. The company's first consignment of 10,000 woven shirts, worth USD 69,000, was shipped to France in 1978 (Yunus & Yamagata, 2012). Since Bangladesh's RMG exports were negligible in this period, the country did not face any export restrictions (i.e., no quota) under the Multi-Fibre Arrangement (MFA). The sector, therefore, attracted inward foreign investment, which led to the establishment of a number of joint ventures or foreign-owned private companies manufacturing RMG in the early 1980s (Alam et al., 2017; Akter, 2020). The government of Bangladesh started to provide various incentives to the RMG industry from the 1980s which included duty-free machinery import, bonded warehouse facilities, and cash incentives (Quddus & Rashid, 2000; Siddiqi, 2005). Because of the rapid

growth of the industry. Bangladesh was eventually brought under the MFA quota system in 1986. However, this helped the Bangladeshi entrepreneurs in three ways viz. receiving protection from foreign competition (Mottaleb & Sonobe, 2011), getting a more generous export quota compared to regional competitors such as India and Sri Lanka (Mlachila & Yang, 2004; Saxena & Wiebe, 2005; Siddiqi, 2005), and opening of new market opportunities such as in the USA (Akter, 2020).

During the late 1980s through the 1990s, the focal point of the industry switched from foreign ventures to homegrown producers and traders (Mottaleb & Sonobe, 2011). These producers increased their exports to large retailers and brands, particularly in the European and North American markets. Such customers usually provide the design of their products, subcontract the production to suppliers from developing countries, and sell the products through their own distribution channels. Working according to the specifications set by large global buyers required upgradation of production processes and product lines by suppliers in Asia and Latin America. This also resulted in, to some extent, transfer of knowledge on frontier issues such as designing, marketing, and branding (Gereffi, 1999; Tewari, 1999; Schmitz & Knorringa, 2000; Bazan & Navas-Aleman, 2004).

The decision to gradually abolish the MFA was made in 1994. The process was initiated in 1995, and the phased termination of the quota system was completed in 2005. This implied that buyers could source products from their favourite suppliers without any restriction on quantity. This, in turn, increased the competitive pressure on the suppliers. Notwithstanding initial apprehension, Bangladesh was able to become a gainer from this race. The number of RMG factories, employment in the sector, and the share of RMG in Bangladesh's total export receipts sustained an upward trajectory which continued post 2005.

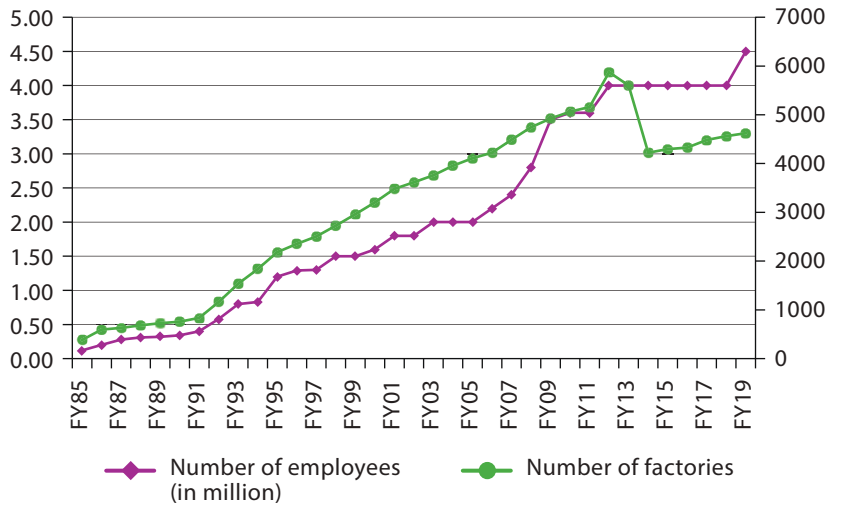
The intensified competition in the global market required the suppliers to ensure swift delivery of their products. This put the woven garment producers at a disadvantage as opposed to their knitwear manufacturer counterparts. The primary reason behind this is that woven garment production relies heavily on imported raw materials, particularly woven textile – which is prone to delays in delivery. Locally produced woven textiles can only meet a fraction of the total industry demand. On the other hand, the production

of knitwear can reap the benefits of having an abundant and quick supply of locally produced yarn and fabrics (Siddiqi, 2005; Swazan & Das, 2022). The knitwear sector has experienced a rapid growth since 1995. In FY1995, knitwear's share in total RMG export was 17.6 per cent. This share rose to 43.9 per cent in FY2005. Knitwear surpassed woven products in terms of export earnings for the first time in FY2008. As of FY2023, knitwear constituted 54.8 per cent of total export receipts from RMG. During July-May of FY2024, the share of export receipts from knitwear within RMG sector was 54.4 per cent.

Bangladesh exports a variety of RMG products for men, women and children including shirts, jackets, trousers, sweaters, t-shirts, etc. Among these, trousers (USD 14,953.30 million) and t-shirts and knitted shirts (USD 10,862.52 million) have the highest export earnings as of FY2023 (BGMEA, 2024a). Bangladesh's export of RMG products is concentrated in two markets, viz., the European Union (EU) and the USA. These two markets accounted for nearly 70 per cent of Bangladesh's total export receipts from RMG in FY2023. The RMG industry's export to the EU was valued at USD 23,527.21 million in FY2023, which was the highest followed by the USA at USD 8,516.91 million (BGMEA, 2024a). In FY2023, Bangladesh's share in EU's RMG import was 21.5 per cent while the corresponding share for the US market was 9.0 per cent.

Over the last two decades or so, the RMG sector has played a pivotal role in the Bangladesh economy in terms of contribution to GDP, employment creation, women empowerment, and other socioeconomic developments (Hasan et al., 2020; Mostafa & Klepper, 2018; Zaman, 2021). In 2021, Bangladesh held a 6.4 per cent market share in global RMG exports. This is higher than competitors such as Vietnam (5.8 per cent), Turkiye (3.5 per cent) and India (3.0 per cent) (WTO, 2022). The substantial volume of international trade helped the industry to grow at a steady pace over the years. Figure 4.1 shows the trajectories of employment and the number of firms in the RMG sector according to BGMEA data listed in various sources. It can be observed that the sector went through a structural adjustment after the Rana Plaza tragedy in 2013, which was indicated by the shutdown of a large number of non-compliant factories. The total number of workers, however, did not change. This implies that an internal reorganisation has taken place within the industry (Haque & Bari, 2021).

Figure 4.1: Employment and Number of Factories in the RMG Sector



Source: Chowdhury et al. (2014), Bangladesh Bank (2020).

Note: The number of factories is shown in the right vertical axis.

The scale of Bangladesh's RMG manufacturing enterprises gives the nation a competitive edge because large manufacturing firms generally have more capital and human resources (Chandra & Ferdaus, 2020; Hasan et al.,2020; Momaya, 2001). They also have a higher risk absorption capacity as compared to smaller businesses (Agrawal et al., 2021; Bair et al., 2020). From the World Bank Enterprise Survey 2014 data, it was found that Bangladesh has 797 employees on average per firm, which is much higher than some of its competitor nations such as Vietnam (426 employees per firm) and China (269 people per firm) (Alam et al., 2017). Moreover, Bangladesh's RMG enterprises' convenient locations (Dhaka and Chattogram) in terms of connectivity and energy availability contribute to their better export performances (Akter, 2020; Islam, 2021). One of the main factors, driving Bangladesh's RMG industry growth, is the country's low labour costs (Mostafa & Klepper, 2018; Rasel et al., 2020). Nonetheless, Bangladesh's RMG industry has struggled with low labour productivity. The country was found to have the lowest labour productivity among the comparators that produce clothing, including Cambodia, Vietnam, Pakistan, India, and China (Akter, 2020).

The government of Bangladesh helped foster the growth of the RMG industry through a number of policy initiatives over the years. The 'bonded warehouse' facilities were offered to the RMG sectors in the 1980s. Under this facility, RMG sector entrepreneurs could import factory inputs without paying any import duties on the condition that they would employ all of the inputs in their export-oriented manufacturing. A penalty would be incurred by anyone selling these inputs in the domestic market. This policy reduced the cost of production and enhanced Bangladeshi RMG products' competitiveness in the global market (Akter, 2020; Swazan & Das, 2022). Another significant policy, namely 'back-to-back L/C' was introduced by the government on a similar timeline. As a result of this facility, the RMG entrepreneurs were able to procure raw or intermediate materials without investing working capital since guarantees were provided by the banks of both the buyers and sellers of the products. In 1993, the government revised the back-to-back L/C policy, stating that the amount of foreign currency used to purchase raw or intermediate materials could not exceed 70 per cent of the value of export receipts. This ensured that 30 per cent of the total export earnings ends up as net foreign exchange earnings. Also, the government allowed duty-free import of machinery for garment manufacturers focused on exports in the early 1980s (Islam, 2021; Rahman, 2014; Yunus & Yamagata, 2012). By reducing tariffs and taxes on the import of raw materials, dyes, and chemicals, the government continued its support towards the apparel industry. It also lowered the interest rates on both short and long-term loans. A noteworthy example of tariff reform was that the average tariff on all RMG products was lowered from 114 per cent in 1989 to 22 per cent in 1999 (Mujeri & Khondker, 2002).

Several external initiatives also contributed towards the growth of Bangladesh's RMG industry. Bangladesh had been benefiting from the Generalised System of Preferences (GSP) facilities for both the EU and the USA markets up until the collapse of Rana Plaza in 2013, which resulted in the deaths of more than 1127 people (Chowdhury & Tanim, 2016). However following this tragedy, the USA withheld GSP facilities, and it has remained this way ever since. Bangladesh currently has access to GSP facilities in 38 nations worldwide which include 27 countries of the EU, UK, Australia, New Zealand, Norway, Switzerland, Japan, Turkey, Russia, South Korea, Canada, and Chile (Akter, 2020). Following the Rana Plaza tragedy, a multi-stakeholder initiative led to the 5-year agreements named the Accord and the Alliance

(Ahlquist & Mosley, 2021; Liu et al., 2019). The main goal of the agreements was to increase worker safety at the RMG facilities. To realise their mission, they collaborate with trade unions as well as brands (Ahlquist & Mosley, 2021) with Accord involving EU retailers and the Alliance the retailers from the US. While significant improvement was observed during the Accord-Alliance era (2013-2018), regrettably, industrial safety in the RMG sector could not maintain similar standards afterwards. The major reasons behind this phenomenon were poor upkeep of safety standards, lack of consistent monitoring, and limited functioning of safety committees (Moazzem & Mostofa, 2021).

4.2 National Commitments for Green Transition

Bangladesh's commitment to protect the environment and address climatic issues, as well as attain green growth and sustainable development is expressly mentioned in a number of national plans and policy documents. However, an exhaustive examination of each may turn out to be an unwieldy exercise. Given this, the present study attempts to focus on selected policy documents that are central to the current discussion.

Constitutional Provision

The Constitution of Bangladesh declares that the protection and improvement of the environment and biodiversity are among the fundamental responsibilities of the state. Article 18 (a) of the Constitution declares, 'The State shall endeavour to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests and wildlife for the present and future citizens'. The focus on both the present and future generations delineate the state's emphasis on sustainability.

Perspective Plan of Bangladesh (2021-2041)

The 'Making Vision 2041 a Reality: Perspective Plan of Bangladesh 2021-2041' envisages a proper balance between ecology, the natural environment, and the needs of the people of the country (GED, 2020a). There will be special emphasis on preserving the productivity of land, conserving and enriching forest resources, improving biodiversity and air quality, decreasing pollution

level, and managing water resources with a view to preventing flooding and water shortages. Environmental governance will be a sound mix of incentives and regulatory policies and the country will move towards achieving full implementation of the 'polluter pays principle' by 2041. A system of air pollution taxes would be levied to incentivise industries to adopt clean technologies. The sustainable use of groundwater will also be an area of focus.

The Eighth Five Year Plan [2020-2025]

The Eighth Five Year Plan (8FYP) explicitly mentions issues related to the promotion of green technologies in the RMG sector. It identifies three major barriers to the adoption of green technologies in the RMG sector: the (i) requirement of large initial investments, (ii) existing incentives disproportionately favouring large businesses enjoying economies of scale, and (iii) inadequate financial incentive from the demand side (GED, 2020b). The Plan outlines measures to overcome these barriers with incentives and punitive measures. Greening initiatives within the industry will be supported through cheap financing instruments and favourable fiscal incentives. The number of special economic zones with proper environmental regulations and infrastructures will be increased in order to monitor and regulate industrial pollution. A national initiative will be launched to create public or private voluntary green building rating systems which would provide guidelines for design, construction, and operational practices that ultimately results in reduction of the environmental impacts of buildings. The government will formulate more policies to reduce emissions from air-polluting industries by developing a 'polluter pay principle with appropriate compensation'. The government will intensify its monitoring activities and impose taxes and fines for the water-polluting industries. With a view to improve the state of water quality in Bangladesh, the government will install effluent treatment plants (ETPs) with online monitoring system in all industries. Furthermore, the government aims to implement a zero-discharge plan in effluent discharging industries to ensure better resource management.

Bangladesh Delta Plan 2100

The Bangladesh Delta Plan 2100 (BDP2100) presents long-term strategies that could be pursued with a view to ensuring food and water security, making headway on the economic front, and attaining environmental sustainability while simultaneously reducing natural disaster-induced threats and developing resilience to climate change (GED, 2018). Among the six specific goals of the BDP2100, two deal directly with issues related to green transition. These are the goals to (i) enhance water security and efficiency of water usage and (ii) achieve optimal and integrated use of land and water resources. The Plan sets strategies to preserve groundwater levels by restricting excessive extraction, ensuring appropriate waste management, reduce pollution in urban and rural areas through monitoring and control measures. It emphasises enhancing green growth through research and development of renewable technologies. It aims to devise innovative financing packages, including grant funding and low-interest financing, to increase the affordability of grid and off-grid renewable energy projects.

Climate Prosperity Plan [2022-2041]

Bangladesh's climate prosperity plan termed the Climate Prosperity Plan (CPP) aims to counteract the adverse impact of climate change on vulnerable communities and industries in Bangladesh (MoEFCC, 2021). It suggests measures to promote green transition in industries such as the textile and RMG sector, including green exports, which can help to reduce emissions and ensure sustainable development. These include financing and investment strategies to support implementation to help ensure the availability of necessary resources to make the transition towards a more sustainable future. Overall, the plan is designed to be holistic and adaptive, which means that it takes into account the interrelated nature of the issues and the need for flexibility to respond to changing circumstances.

As a response to the global policy shift towards the adoption of renewable energy, net zero carbon commitment, and carbon border adjustment taxes in the European Union (EU) and other major economies, the plan foresees the

establishment of a green exports programme and a national carbon finance coordination hub. The major milestones of the green export programme include facilitating green logistics by 2021, ensuring Leadership in Energy and Environmental Design (LEED) Certification of 500 additional factories by 2023, ensuring financial access and allocation of credit across sectors for greater export diversification by 2023, 100 per cent LEED Certification for strategic export industries by 2030, and reduction of logistics cost by 50 per cent by 2030. The national carbon finance coordination hub includes carbon tax and carbon-pricing strategies that would increase economic cooperation, improve market access through competitive positioning globally, and enhance export competitiveness and diversification. Green tax influences the garment factories to set up waste treatment facilities and the brick factories for environment friendly production (Keane et al., 2010).

National Industrial Policy 2022

The National Industrial Policy 2022 (NIP2022) outlines the socio-economic development of the people via accelerating inclusive growth in Bangladesh through sustainable and environment-friendly industrialisation as one of its core objectives (MoI, 2022). It includes a separate chapter (chapter 17) on the management of environment-friendly industries, as well as industrial waste. Active participation by industry and business associations, NGOs, and other social organisations in the areas of industrial waste management and conservation of the environment will be encouraged (article 17.1). Industries would be encouraged to install ETPs and Common Effluent Treatment Plants (CETPs) on their premises (article 17.2). The establishment of green and climate-adaptive industries will be incentivised, and loans from Bangladesh Bank's Green Fund and Technology Upgradation Fund will be provided to transform productive industries into green and compliant ones (article 17.5). Industrialisation in high-intensity and highly productive agricultural land will be discouraged (article 17.7). The Policy aims to encourage entrepreneurs to follow the 5R (Refuse, Reduce, Reuse, Repurpose, and Recycle) Strategy while setting up and operating in industries (article 17.9). Provision of special incentives will be made for importing environment-friendly technologies and machinery and producing environment-friendly goods (article 17.11).

A number of other articles in the NIP2022 also touch upon the issue of environment-friendly industrialisation. For instance, article 8.7 mentions discouraging unplanned industrialisation. Industries that were established without proper planning, including those in metropolitan areas, will be gradually relocated to economic zones, export processing zones, or BSCIC Industrial Cities. Steps will be taken to increase the green productivity of industries alongside increasing workers' productivity (article 10.1). Policy support, economic incentives, and resource support will be provided to encourage the installation of solar power systems (both centralised and discrete) in industries within industrial parks, hi-tech parks, and economic zones (article 12.11). Special facilities will be provided for industries or factories that are utilising renewable energy (article 12.19).

Other Policies

Besides the aforementioned ones, there are a large number of environment-related policies and laws to protect the environment, ensure efficient use of energy and its conservation, encourage the use of renewable energy, limit industrial water and chemical use, manage wastewater and solid waste, etc. Starting from the 1970 Water Pollution Control Ordinance, these policies, acts and guidelines are geared towards contributing to industrial pollution

control (Table A4.1). Responsibility for adapting to and mitigating climate and environment-related externalities falls primarily to the Department of Environment (DoE) within the Ministry of Environment, Forest and Climate Change (MoEFCC), and partly to the Sustainable and Renewable Energy Development Authority (SREDA) and Power Division within the Ministry of Power, Energy and Mineral Resources (MoPEMR), and the Ministry of Industries (MoI). These agencies are also promoting, inter alia, zero discharge of industrial effluent, wastewater treatment plants, ISO 14000 certification, etc. Moreover, policies and guidelines, such as the Renewable Energy Policy of Bangladesh (2008), the Energy Efficiency and Conservation Master Plan up to 2030 (2015), and the Net Metering Guidelines (2018), have been contributing towards the quick diffusion of energy efficiency facilities and equipment in the industries.

While the government has formulated a wide array of laws, plans, and policies to address Bangladesh's climatic and environmental challenges, these often do not appear as part of a coordinated and integrated sustainable development strategy. As mentioned in the 8FYP, how these laws and regulations interact with each other and how they cater to the overarching goal of reconciling economic development and environmental sustainability remains unclear (GED, 2020b).

5. ENABLERS AND CHALLENGES OF GREEN TRANSITION IN LITERATURE

Green industries can significantly impact a country's socioeconomic development and provide the basis for sustainable industrial development (Sun et al., 2021). Growth of green industries can be correlated with national economic development. From their study on China, Chen, Chen, Xu, Liu, and Niu (2017) found that a 1 per cent increase in green products exports leads to a 0.04 per cent increase in GDP. Ge and Zhi (2016) mention that there is a complex relationship between the green economy and employment generation. While the green economy has a generally positive impact on employment generation, the scenario can be the opposite depending on the country context and prevailing policy framework. Another study found that by practicing green methods, adverse environmental effects could be reduced, and energy could be saved (Hashim et al., 2015).

Sustainability in manufacturing and services has been a topic of interest for many businesses, leading to numerous studies and initiatives. Sustainability in production has become a central issue for dynamic business development (Jayal, Badurdeen, Dillon, & Jawahir, 2010). Globally, many businesses have adopted sustainable practices to increase their competitiveness, enhance customer relationships, improve product quality (Székely & Knirsch, 2005), and support continuous growth and expansion (Gunasekaran & Spalanzani, 2012). Sustainable practices include, inter alia, sustainable materials use (Smith & Ball, 2012), pollution prevention (Rusinko, 2007), sustainable production processes (Upadhye, Deshmukh, & Garg, 2010), and waste management (Gandhi, Selladurai, & Santhi, 2006). Adopting sustainable production processes enables businesses to become more viable. Manufacturers have taken various measures to enhance the sustainability of their products, including new additive formulations and technologies that minimise environmental impact and focus on reducing waste and energy consumption (Jayaraman, Singh, & Anandnarayan, 2011). To this end, customer demands are considered critical external sources of pressure. If a buyer requests green products and services, a business needs to transform the existing organisational setup and technology to cater to the demand for new environment-friendly products (Srivastav & Gaur, 2015).

A green garment factory can be characterised by sustainable garment production. Such a factory may be involved in activities that include clean manufacturing practices, green building construction, and beneficial corporate social responsibility (CSR) practices (Mittal et al., 2018). Green factories limit the use of natural resources; reduce harmful ecological impacts during the entire production cycle; produce environment-friendly products; decrease energy consumption; and reduce carbon emissions (Tan & Loh, 2008). Therefore, it can be argued that the two main components of a green factory are clean production and green building.

Construction of a green building entails utilising environment-friendly and resource-efficient methods throughout the entire lifecycle of the building. This includes design, construction, operation, maintenance, deconstruction, and reconstruction. Green factory buildings are built with a view to decreasing detrimental impacts on human health, natural resources, and the environment. According to the UN Environment Programme, clean production is an integrated system of procedures, products, and services to enhance production efficiency and decrease environmental and human risks (Barshilia, 2014).

The perception of green production to be somewhat of a luxury market with high capital costs and lower returns presents a barrier to such initiatives (Darko et al., 2013). While there is some understanding as regards the long-term economic benefits, more empirical studies on the savings and expenses related to greening of factories are required. This will enable the entrepreneurs to assess the financial case for their actions (Awal et al., 2021).

Construction and maintenance of a green factory require skilled human resources and substantial investment. The need for more well-trained and experienced experts with environmental knowledge to facilitate the green transition process is quite evident. It can be challenging to find employees well-trained in green practices and manufacturing (Zinia & McShane, 2018). Furthermore, green designers, engineers, architects, contractors, and workers are mostly unavailable in remote areas as most such professionals prefer to work in major cities since urban areas offer better facilities for their career and family life (Srivastav & Gaur, 2015).

A business will attain higher innovative capacity when information and knowledge can be shared effectively (Stremlau & Tao, 2016). In this connection, it must also be noted that it can be more challenging for a small business to implement the green transition process (Gomes & Daud, 2019).

As opposed to conventional garment factories, high costs are significant challenges for the green ones. For instance, costs owing to green manufacturing, eco-friendly packaging and labelling, and marketing can be disproportionately high (Barshilia, 2014). In general, managing environmental impacts entail two types of costs viz. direct expenditures and transaction fees. These are considered to be key obstacles to transition into green factories. Modern technology adoption, IT enablement, recruiting highly qualified employees, and training and motivating workers towards sustainable garments manufacturing require high initial investment (Stremlau & Tao, 2016).

While innovative green business practices may open new market opportunities, and promote creative design and good quality, these are often not reflected in product prices. Buyers are often not interested in paying more for green factory manufactured products. Also, many consumers prioritise price over eco-friendliness and environmental consciousness (Srivastav & Gaur, 2015). In this context, Aktar and Islam (2019) mentioned that the need for more bargaining powers and negotiation skills can be great hurdles for garment entrepreneurs. Also, in the face of high competition, businesses end up offering low prices to the brands and buyers. This race to the bottom is a barrier to greening the RMG and textile industries (Zinia & McShane, 2018).

Rapid changes in technology can become hurdles in the path of adopting green practices (Awal et al., 2021). Inadequate information and technological limitations, such as dated machinery or equipment at business facilities, can exacerbate this situation. Some organisations hesitate to implement the latest technologies due to the inertia to change their conventional model. As mentioned earlier, high investment requirements and a lack of skilled personnel also add to the problem.

Finally, government rules and regulations can be significant drivers for the green transition of businesses. Sarkar, Qian and Peau (2020) mentioned that

state regulations raise the fear of fines and penalties for non-compliance among organisations. Usually, this is beneficial for developing and adopting environment-friendly practices in the manufacturing sector. However, if the government policy directives fail to take cognisance of the opportunities associated with green transition or make environment-friendly activities less beneficial and more arduous, then these can be considered as obstacles (Kulatunga, Jayatilaka, & Jayawickrama, 2013).

6. GENERAL INFORMATION OF FACTORIES SURVEYED

Among the surveyed factories, 20.60 per cent are large, 21.09 per cent are small and medium, and 58.31 per cent are micro in size as per the aforementioned BBS categorisation. The minimum number of workers in large factories is 250 and the maximum is 16,225. For small and medium factories, the minimum number of workers is 25, and the maximum is 245, while for micro-factories, the minimum number of workers is 10, and the maximum is 24.

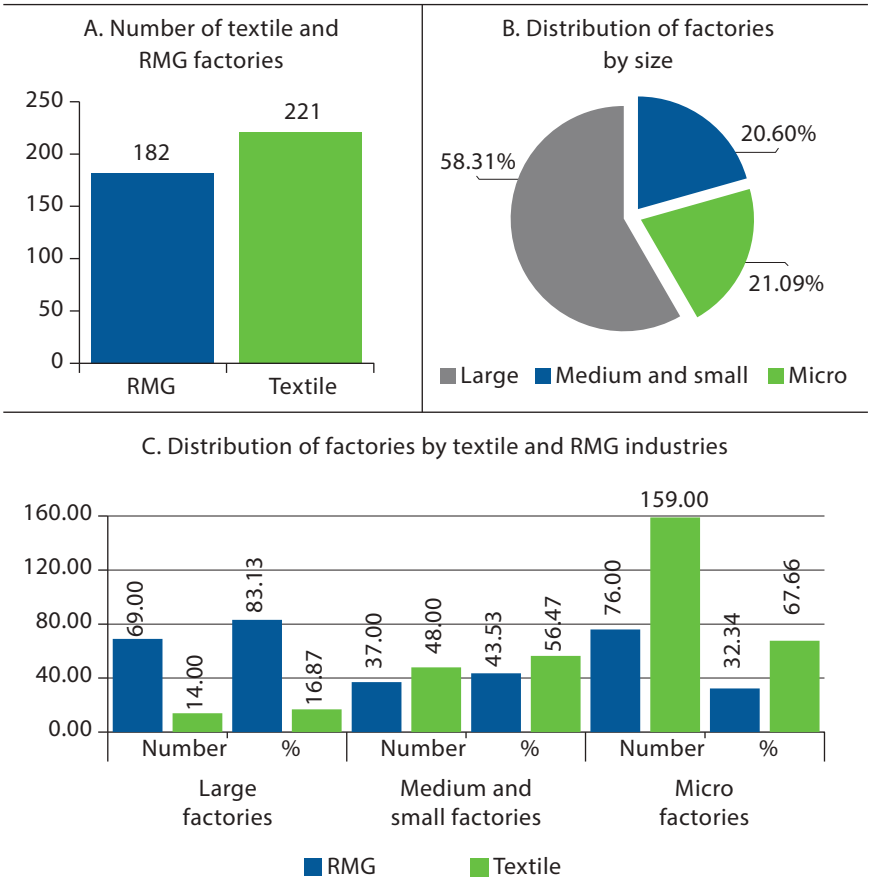
Factories are further categorised tier-wise, with large factories located in the export processing zones (EPZs) which have direct contact with the foreign buyers designated as Tier 1, large and medium factories located outside the EPZs which have direct relations with the foreign buyers designated as Tier 2, and factories of various sizes including medium to small and micro located outside the EPZs which do not have any direct link with foreign buyers categorised as Tier 3 (Khan and Wichterich, 2015). Of the factories surveyed, 7.69 per cent of the RMG factories fall under Tier 1, 30.22 per cent under Tier 2, and a large share (62.09 per cent) falls under Tier 3. Tier-wise distribution of surveyed factories is presented in Figure A6.1. Figure 6.1 presents the distribution of factories by industry and size.

If types of products are taken into consideration, then among the RMG factories, those producing woven garments constitute the largest share (40.11 per cent) followed by the factories manufacturing mixed products (24.18 per cent) and knit garments (21.98 per cent). Among the textile factories, the overwhelming share is held by those engaged in general fabric manufacturing (76.02 per cent) followed by mixed factories (10.86 per cent). The detailed distribution of factories by product types is presented in Table A6.1.

6.1 Practices of Greening Factories

The current study analysed some features of the green-certified factories. Among the 83 large factories that were surveyed, 31.33 per cent are green certified and 15.66 per cent of the factories have applied for green certification, while 53.01 per cent of the large factories in the sample do not have green certification. However, among the non-green factories, many

Figure 6.1: Distribution of Surveyed Factories by Industry and Size



Source: Calculated from the CPD Green Transition Study survey data.

follow sustainable practices to comply with environmental requirements and certification by international buyers. These environmental certifications include BCI, BSCI, GOTS, Higg Index, Sedex, and OEKO-TEX, etc. Among the surveyed factories that achieved these environmental certifications, the highest percentage (18.42 per cent) of factories achieved Sedex. The second highest percentage of the certification category is OEKO-TEX, with 17.11 per cent, and OCS, with an equal percentage (Table A6.2). The majority of these certificates are provided by independent international bodies and are essential prerequisites to exporting products abroad.

Figure 6.2 Factories' Knowledge About Green Certification

Source: Calculated from the CPD Green Transition Study survey data.

In terms of awareness and knowledge, large factories are more aware of green certification than others. Micro-sized factories are much less aware (Figure 6.2). During the FGDs and KIIs with factory owners and managers, it was revealed that factors such as access to information, resources for certification, and overall capacity to adopt environmentally compliant practices are key reasons for such variations in knowledge about green certificates.

The owners and managers of factories were asked a number of questions to check whether environmental sustainability issues are considered in factories' policies and operational systems. The analysis shows that large factories are doing better in the indicators such as considering environmental sustainability in strategic objectives, having sustainable policies, identifying environmental protection as factories' corporate social responsibility (CSR), and assigning designated person for environmental sustainability issues. Even within large factories, there is scope of improvement in the area relating to assigning specific person for working on environmental sustainability issues. The small and medium factories, and micro factories are generally lagging in all aspects (Table 6.1).

Table 6.1: Percentage of Factories Which Have Embedded Greening in Their Policies or Workforce

Green orientation	Large factories n=83	Small and Medium factories n=85	Micro factories n=235	All factories n=403
Mention environmental sustainability issues to prevent future health and environmental damage in strategic objectives	90.36	15.29	6.38	25.56
Have clear policies promoting environmental sustainability or awareness in all functional areas	91.57	14.12	8.51	26.80
Identify environmental protection as its corporate social responsibility	91.57	17.65	9.36	28.04
Have a designated person to work on sustainability (or even a `gHead of Sustainability')	59.04	2.35	0.85	13.15
Have a separate environmental compliance manager/officer	74.70	1.18	0.85	16.13

Source: Calculated from the CPD Green Transition Study survey data.

6.2 Motivation for Greening Factories

Overall, self-motivation, market-driven factors, such as buyer requirements, and a desire for becoming competitive are the major reasons for factories to obtain green certification (Table 6.2). This implies that there exists a willingness among factories to voluntarily embrace sustainable practices and align with market demands for environment-friendly processes. In case of the non-green certified factories, the reasons to obtain green certificate include their commitment to sustainability, demand from buyers, and a recognition of the marketing benefits associated with the green certification. It is notable that government regulations on environmental standards appear to have a relatively weaker influence on the decisions of both green certified and non-green certified factories.

Table 6.2: Motivations for Obtaining Green Certificate

Reasons	Factories with Green certificate		Factories that do not have green certificate but want to obtain in the future	
	Frequency	% of Cases	Frequency	% of Cases
Self-motivation	21	80.77	27	61.36
Buyers' requirement	19	73.08	16	36.36
Sustainability practice	18	69.23	17	38.64
To become more competitive	18	69.23	17	38.64
Marketing strategy	17	65.38	23	52.27
Buyers' influence	10	38.46	17	38.64
Government environmental regulations	7	26.92	10	22.73
Following other factory examples	1	3.85	2	4.55
Others	-	-	4	9.09

Source: Calculated from the CPD Green Transition Study survey data.

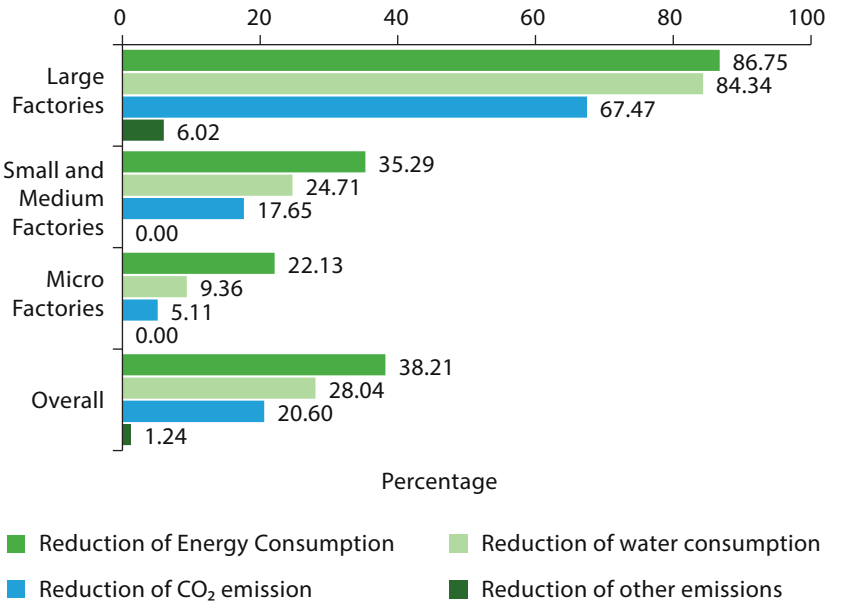
Note: Since multiple responses were accepted, the sum of the shares could be greater than 100.

7. GREEN MEASURES UNDERTAKEN BY FACTORIES

7.1 Whether the Factories Set Greening Related Targets

From the survey data, it was revealed that large factories are doing better compared to small and medium, and micro factories in terms of setting targets related to consumption of natural resources and emissions. The overwhelming majority (over 80 per cent) of large factories have targets related to the reduction of energy and water consumption. Regarding the reduction of CO_2 emissions, 67.47 per cent large factories have a relevant target, whereas only 17.65 per cent small and medium factories have a similar target (Figure 7.1).

Figure 7.1: Share of Factories with Targets Related to Consumption of Natural Resources and Emissions

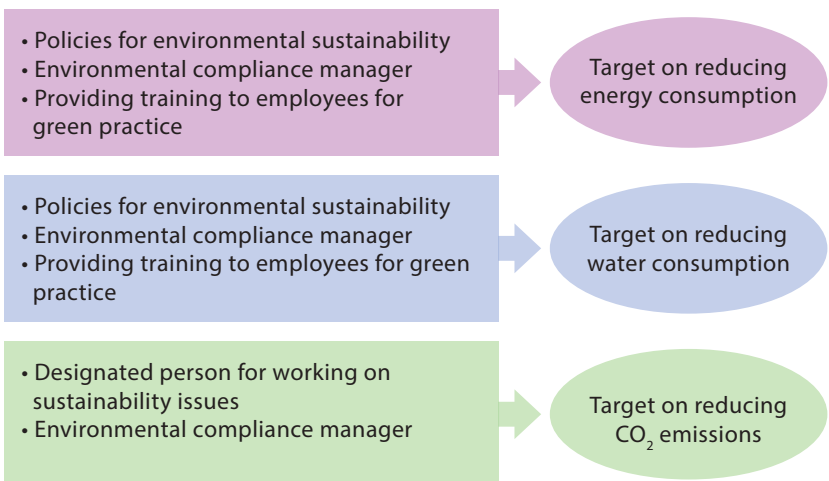


Source: Calculated from the CPD Green Transition Study survey data.

The study identified the factors influencing the factories' targets related to reducing energy consumption, water consumption, and CO_2 emissions. A probit regression analysis revealed that having policies for promoting environmental sustainability, assigning environmental compliance managers, and providing training to employees regarding green practices have a significant influence on factories' setting targets on energy consumption and water consumption. For the target of reducing CO_2 emissions, having a designated person working on sustainability issues, and having an environmental compliance and sustainability manager are the significant factors (Figure 7.2).

The probit regression analysis shows that having policies for environmental sustainability increases the likelihood of setting energy consumption reduction related target by 47 per cent with statistical significance. Similarly, having an environmental compliance manager in the factory and providing training to employees increases the likelihood of setting energy consumption reduction targets by 95 per cent and 41 per cent, respectively

Figure 7.2: Factors Influencing the Targets Related to Natural Resources and Emissions



Source: Authors' illustration based on the CPD Green Transition Study survey data analysis.

(Table A7.1). The probit regression analysis also shows similar results for water consumption reduction related targets (Table A7.2). For the target of reducing CO_2 emissions, having a designated person to work on sustainability issues increases the likelihood by 96 per cent, and assigning an environmental compliance manager increases the likelihood by 44 per cent (Table A7.3).

7.2 Where are the Factories Investing and How Much?

Factories are investing in greening in areas such as energy, water, air, and waste management by way of technology upgradation. Their investments are for energy conservation technologies, renewable energy-related technologies, building-level[3] water metre, building-level energy metre, technologies for air pollution control, dust control, solid waste management, and wastewater management (Figure 7.3).

A probit regression analysis was carried out to find out the factors influencing current greening related investment in the factories. The analysis revealed that energy conservation-related technology (LED lights, servo motors, etc.) increases the likelihood of green investment in the factories by 46 per cent with a high statistical significance. Renewable energy-related technologies such as solar home systems and building-level energy metres also increase the likelihood of investment by 58 per cent and 18 per cent, respectively (Table A7.4). It is worth noting that many factories are adopting these technologies to reduce costs and increase their competitiveness in the industry.

The probit regression analysis finds that having a building-level water metre in the factory increases the likelihood of green investment by 63 per cent with a high level of statistical significance (Table A7.5). In this connection, it is also worth noting that there is no industrial water pricing policy in Bangladesh. More than 90 per cent of the surveyed factories use groundwater for which no cost is incurred (Table A7.6). As a result, water conservation related measures are less likely to be adopted by the factories. However, this is a very important area where intensified attention is required from the perspective of environmental sustainability, as excessive groundwater use is leading

[3]This is a system to support resource management and identify opportunities for additional resource savings by tracking building-level resource use. For more details, please see: https://www.usgbc.org/credits/core-and-shell/v4-draft/eap3

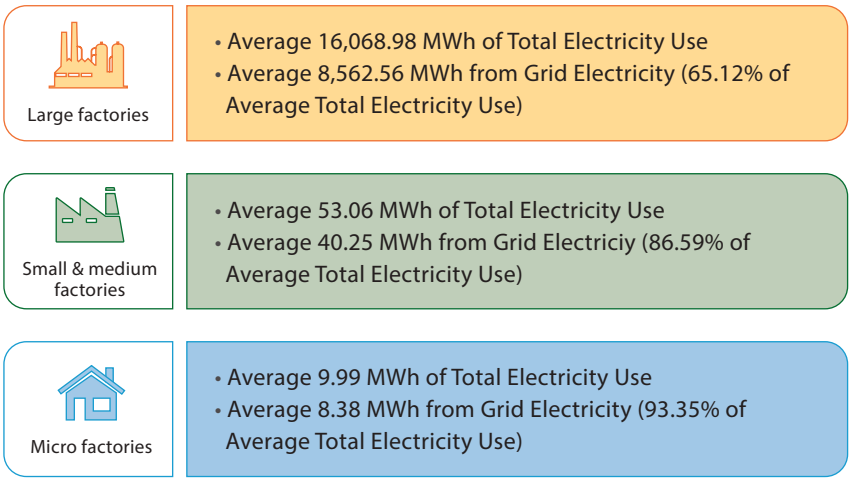
Figure 7.3: Green Investment of Factories in Various Greening Practices

Source: Authors' illustration based on the CPD Green Transition Survey data analysis.

to its rapid depletion. Both air pollution and dust control technologies are found to be important for investment by factories. Adoption of air pollution control technologies increases the likelihood of green investment by the factories by 85 per cent, and dust control-related technology adoption increases the likelihood of green investment by 92 per cent with statistical significance (Table A7.7). The probit regression analysis also shows that solid waste management and wastewater management increase the likelihood of investment decisions by 97 per cent and 47 per cent, respectively, with statistical significance. However, technology related to chemical waste reduction and reuse of waste has no statistical significance (Table A7.8).

The survey data analysis indicates that small and medium and micro-sized factories have a greater reliance on grid electricity compared to the large

Figure 7.4: Average Use of Electricity in a Month by Factories



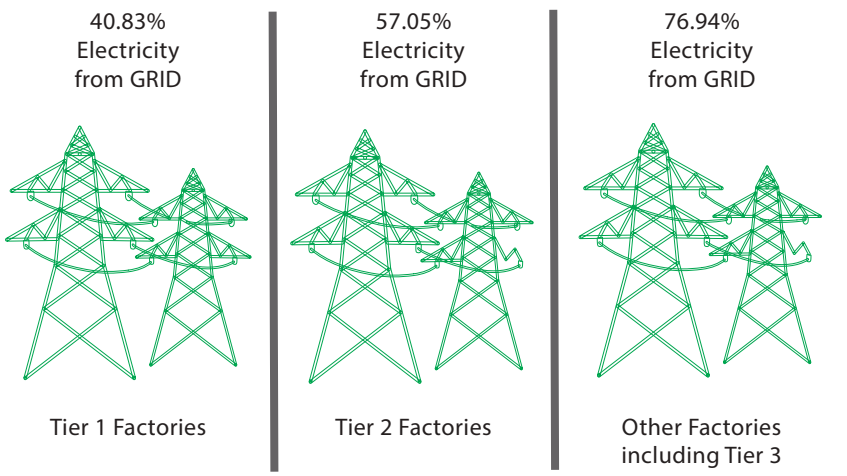
Source: Calculated from the CPD Green Transition Study survey data.

factories. Small and medium-sized factories depend on the grid for about 86.59 per cent of their electricity consumption, while micro factories rely on it for approximately 93.35 per cent of their power consumption. This information is presented in Figure 7.4.

Similarly, Tier 3 RMG factories have the highest dependency on grid electricity (76.94 per cent). This is followed by Tier 2 factories, which use 57.05 per cent of their electricity from the grid, and Tier 1 factories, which use 40.83 per cent of their requirement from grid electricity (Figure 7.5).

Factories have invested in the adoption of technologies for the conservation of energy and water, air pollution control, and waste management. The share of factories which invested in greening during the last five years was more than 91.57 per cent in the case of large factories, 20 per cent in the case of small and medium factories, and 13.19 per cent for micro-factories (Table A7.9).

Figure 7.5: Source of Electricity Use by RMG Factories in Tier Groups

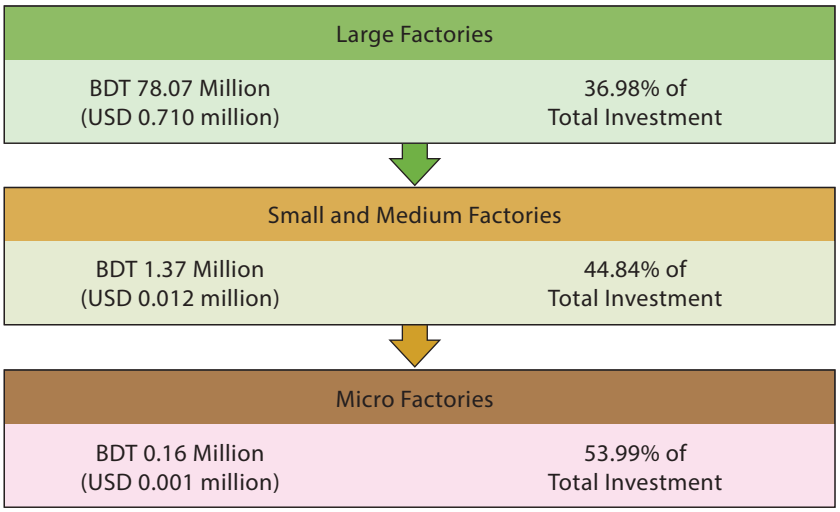


Source: Calculated from the CPD Green Transition Study survey data.

For large factories, the average green investment during the last five years was BDT 78.07 million (USD 0.710 million), which is 36.98 per cent of their total investment. For small and medium factories and micro factories, the average green investment during the last five years was BDT 1.37 million (USD 0.012 million) and BDT 0.16 million (USD 0.001 million), respectively (Figure 7.6). Although the volume of green investment by small and medium, and micro factories is lower compared to large factories, the share of green investment in their total investment is higher than that of the large factories.

Through the KIIs, it was revealed that most green certified factories use, among others, solar panels, metering systems to monitor and efficiently use electricity, LED lightbulbs, servo motors, exhaust fans, rainwater harvesting, water recycling technologies, and ETPs. Curiously, despite not being certified, most non-green certified factories also deploy various environment-friendly technologies. However, the variety and extent of technology use depend on factors including industry type and factory size. While massive undertakings such as rainwater harvesting, water recycling systems, and ETPs can be mostly found in large factories, solar panels, LED bulbs, exhaust fans, etc., can be found in both larger and smaller factories.

Figure 7.6: Factory Group-wise Average Green Investment in Last Five Years



Source: Calculated from the CPD Green Transition Study survey data.

7.3 Determinants of Green Investment

The study also investigated the important determinants of green investment in the textile and RMG sector in Bangladesh. An analysis of the survey data using a probit model revealed that having owners or managers with training or degrees related to sustainability or greening factories, considering environmental sustainability in the factories' strategic objectives, and having energy conservation targets are very significant determinants for green investment, which increases the investment likelihood. A number of factors were included in the probit model such as training or degree related to sustainability or green practice, environmental sustainability in the factories' strategic objectives, factories' policy for promoting environmental sustainability, environmental protection as CSR, energy conservation target, water conservation target, and emissions reduction target. The probit regression analysis revealed that training or having a degree related to sustainability increases the likelihood of making green investments by 54 per cent with significant probability. Likewise, mentioning environmental sustainability in the factories' strategic objectives also increases the likelihood

of taking green investment decisions by 38 per cent, and the factories' energy conservation target also increases the likelihood by 79 per cent with significant probability (Table 7.1).

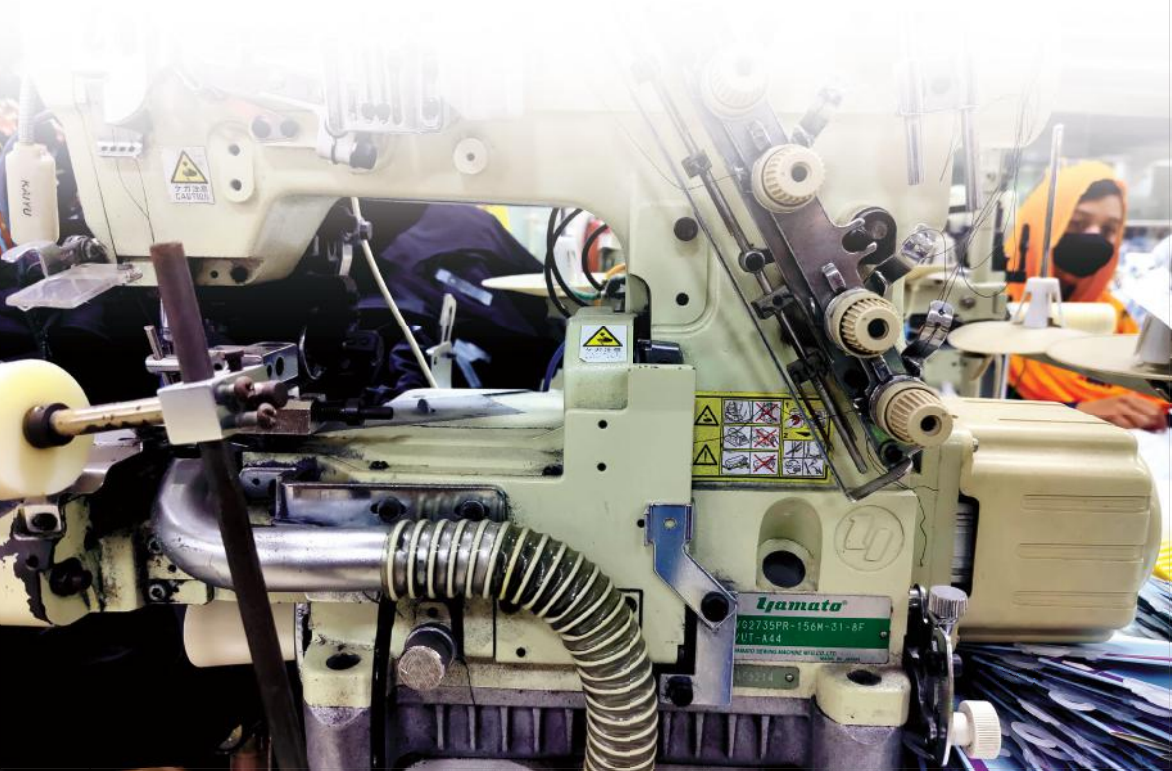
Table 7.1: Determinants of Green Investment in the Textile and RMG Sector in Bangladesh

Determinants	Coef.	St. Err.	T-value	P-value	Sig
Training or degree related to sustainability or greening factory or environmental compliance	0.54	0.28	1.93	0.05	*
Mention of environmental sustainability in the factories' strategic objectives	0.38	0.28	4.60	0.00	***
Policies for promoting environmental sustainability	0.23	0.31	0.74	0.46	
Considering environmental protection as CSR	-0.04	0.28	-0.15	0.88	
Energy conservation target	0.79	0.21	3.75	0.00	***
Water conservation target	-0.16	0.28	-0.57	0.57	
CO_2 emission reduction target	0.14	0.28	0.50	0.61	
Other emission reduction target	-0.21	0.69	-0.31	0.76	
Constant	-1.33	0.11	-12.14	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

During the KIIs, the factory owners and managers listed several potential benefits of adopting green technologies, such as a safe and healthy working environment for employees, lower energy bills and cost savings, reduced environmental impact, increased brand value and reputation, and increased customer interest. They also mentioned that better ventilation and temperature management positively impact workers' productivity. At the same time, higher initial investment costs, ongoing maintenance and management costs, reduced profit margins, and challenges in adapting to new technologies and processes were perceived to be significant barriers associated with adopting green technologies. Inadequate knowledge regarding the type and availability of green technologies was also mentioned as a considerable challenge. During the KIIs, it was also mentioned that there is a shortage of skilled human resources to maintain the technology.



8. SOCIAL ASPECTS OF GREENING FACTORIES

A total of 4,541 workers were interviewed from the surveyed factories. The gender distribution of workers varies significantly between the RMG and the textile industry. It also varies according to factory sizes. In the large RMG factories, 58.88 per cent of the respondents were female and 41.12 per cent were male respondents (Table A8.1).

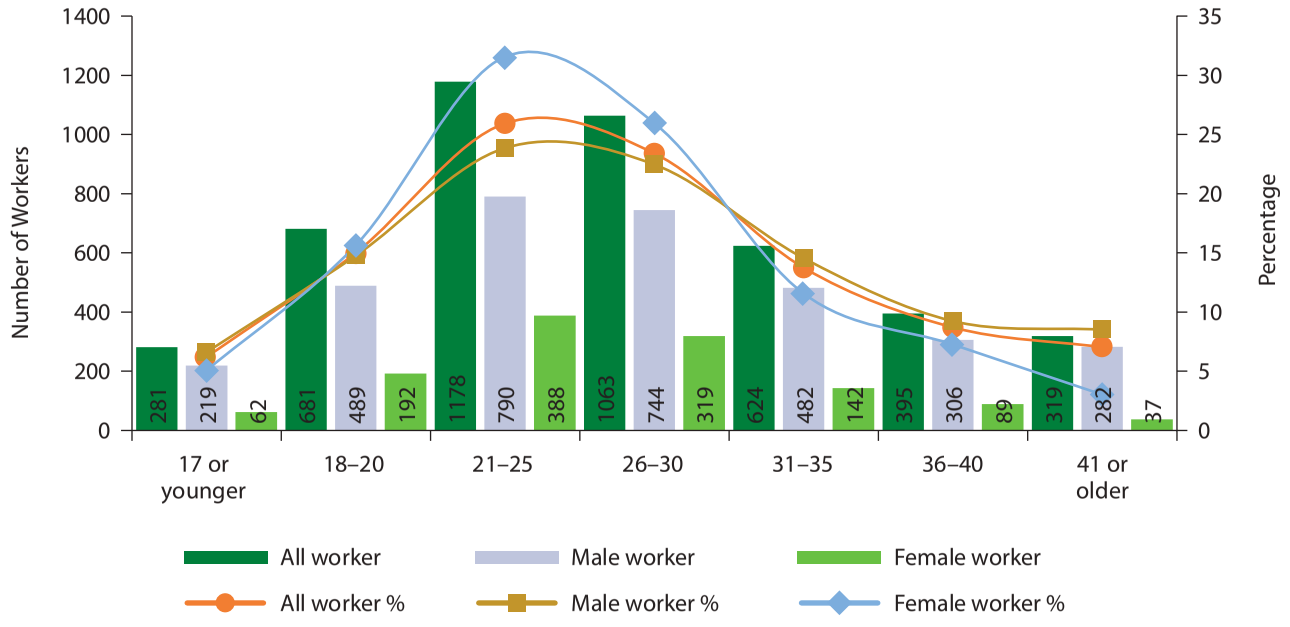
The textile industry reveals a different pattern in terms of gender representation. In the large textile factories, the share of female respondents is 27.08 per cent and the share of male respondents is 72.92 per cent. Factors such as the nature of work, factory size, location, and industry-specific dynamics may contribute to these differences in gender representation among the workers.

It is evident from the survey that the age group of 21-30 years comprises a significant portion of the surveyed workers, with the majority in the 21-25 years range. The concentration of female workers is mostly in the 21-25 and 26-30 age groups while that of male workers follows a similar pattern. Figure 8.1 presents the distribution of workers by age and gender. This information can be valuable for understanding the demographics of the workforce in the studied industries.

8.1 Knowledge/Awareness of Green Practices Among Workers

Analysis of the survey data revealed that workers in large factories are more aware of green or environment-friendly practices in the factory - albeit with a limited understanding of the concept - compared to workers from other types of factories. Of the workers in large factories, 99.26 per cent are aware of green or environment-friendly practices in the factory. On the other hand, 78.02 per cent of workers in small and medium-sized factories and 79.57 per cent of workers in micro factories are aware of such practices in the factory (Table 8.1).

Figure 8.1: Age Group Distribution of the Workers



Source: Calculated from the CPD Green Transition Study survey data.
Note: Percentage is shown in the right vertical axis.

Table 8.1: Share of Workers with Knowledge/Awareness of Green Practices

(in per cent)

Category	Large factories	Small and medium factories	Micro factories	Overall
Know about green practices or environment-friendly practices	99.26	78.02	79.57	86.26

Source: Calculated from the CPD Green Transition Study survey data.

An aggregated probit model was used to understand the demographic impact on workers' knowledge regarding green practices in the factory. In this model, gender, education, age, and job experience of workers were considered. The result revealed that demographic perspectives, gender, education, and age are significant factors in having knowledge regarding green practices.

A disaggregated probit model was also applied to see the marginal effect of the base category of each variable on workers' knowledge about green practices. Considering the female workers as a base, the result finds a 45 per cent likelihood of male workers having less knowledge compared to female workers (Table 8.2). For education, the primary level was considered as base. In this case, it was found that having a secondary school certificate and a higher secondary school certificate increases the likelihood of possessing knowledge of green practices by 24 per cent and 90 per cent, respectively. It was also found that compared to having a primary school certificate, having no education decreases the likelihood of possessing knowledge regarding green practices by 32 per cent (Table 8.2).

To see the impact of age on workers' knowledge about green practices, those 17 years or younger are considered as the base for seeing the marginal effect on other age groups. The results show that workers aged 26-30 years have the highest likelihood (Table 8.2). This implies that workers aged between 26 and 30 years have a 71 per cent likelihood of having more knowledge than those aged 17 years or below. Workers from other age groups also have better knowledge about green practices in the factory than younger workers. However, the analysis finds no significant impact of job experience on workers' knowledge about green practices in the factories (Table 8.2).

Table 8.2: Demographic Impact on Workers' Knowledge Regarding Green Practices

Variable	Coef.	St. Err.	T-value	P-value	Sig
Gender: base female					
Male	-0.45	0.07	-6.91	0.00	***
Education: base primary education					
Secondary school	0.24	0.06	4.35	0.00	***
Higher secondary school	0.90	0.14	6.44	0.00	***
Graduation or equivalent	0.39	0.21	1.85	0.06	*
Post-graduation (MBA, Masters or PhD)	0.77	0.44	1.73	0.08	*
No educational qualification	-0.32	0.08	-3.91	0.00	***
Age: base 17 years or younger					
18-20 years	0.43	0.10	4.21	0.00	***
21-25 years	0.66	0.09	6.68	0.00	***
26-30 years	0.71	0.10	6.99	0.00	***
31-35 years	0.63	0.11	5.72	0.00	***
36-40 years	0.66	0.12	5.52	0.00	***
41 or older	0.66	0.13	5.27	0.00	***
Job experience: base 0-3 months					
4-6 months	0.31	0.13	2.27	0.02	**
7-9 months	0.13	0.16	0.81	0.51	
10-12 months	0.17	0.11	1.50	0.15	
13-18 months	0.21	0.17	1.21	0.23	
19-23 months	-0.09	0.18	-0.47	0.63	
2 years	0.12	0.09	1.28	0.22	
3 years	0.09	0.10	0.91	0.42	
4 years	0.14	0.11	1.33	0.15	
5 to 8 years	0.07	0.09	0.80	0.48	
9 years or more	0.04	0.10	0.48	0.66	
Constant	0.04	0.10	0.63	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

From another probit analysis, it was revealed that the adoption of new machines and training programmes are generally important beneficial factors for workers towards implementing green practices (Table 8.3). However, in a disaggregated manner, the result indicates that for large factories, training programmes on green practices are more important than the adoption of

Table 8.3: Beneficial Factors for Workers Towards Implementing Green Practices

Variable	Coef.	St.Err.	t-value	p-value	Sig
Overall					
Adoption of new machine/technology	0.68	0.11	5.96	0.00	***
Training programme on greening factory	0.85	0.11	7.72	0.00	***
Constant	1.26	0.03	38.07	0.00	***
Large factories					
Adoption of new machine/technology	0.50	0.37	1.35	0.18	
Training programme on greening factory	0.93	0.35	2.69	0.01	***
Constant	2.01	0.18	11.46	0.00	***
Small and medium factories					
Adoption of new machine/technology	0.53	0.18	2.96	0.00	***
Training programme on greening factory	0.53	0.23	2.30	0.02	**
Constant	1.20	0.06	21.00	0.00	***
Micro factories					
Adoption of new machine/technology	0.60	0.18	3.26	0.00	***
Training programme on greening factory	0.20	0.17	1.15	0.25	
Constant	1.23	0.04	28.75	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

machines and technology for bringing benefits to the workers. It can be argued that large factories already can adopt new machinery and technology. Hence, a training programme on greening factories will be more beneficial for the workers. On the other hand, both the adoption of machinery and technology and training programmes on greening factories are important for small and medium factories. For instance, adopting machinery increases the likelihood of benefits for the workers in medium factories by 53 per cent. For micro factories, adopting new machinery or technology appears to be the more beneficial factor. Adopting machinery increases the likelihood of bringing benefits for the workers by 60 per cent in micro factories (Table 8.3).

8.2 Productivity and Sickness of Workers

Table 8.4 shows that respondents from large factories, as well as those from small and medium and micro factories, perceive 'reduced health hazards' and 'improved work productivity' to be the most significant benefits arising from greening factories. Most respondents across all types of factories perceive reduced health hazards as a benefit of green practices, with shares ranging from 84.48 to 96.86 per cent. This is followed by 'improved worker productivity' with shares ranging from 75.71 to 95.07 per cent and 'improved factory productivity' ranging from 63.87 to 84.16 per cent. 'Reduced health/medical costs' is also widely perceived as a benefit, with percentages ranging from 63.13 to 89.58 per cent. Notably, the benefit concerning 'increased factory profit' is less widely perceived, with shares ranging from 15.95 to 34.09 per cent (Table 8.4).

Table 8.4: Benefits of Greening Factories from Workers' Point of View

Benefits of green practices	Large factories	Small and medium factories	Micro factories
Reduced health hazards	96.86	81.54	84.48
Reduced health/medical costs	89.58	65.20	63.13
Improved workers' productivity	95.07	76.33	75.71
Improved factory productivity	84.16	64.59	63.87
Increased factory profit	34.09	33.80	15.95
Others	0.12	0.60	0.74
Don't know	0.86	1.71	2.09

Source: Calculated from the CPD Green Transition Study survey data.

Large factory workers are more likely to meet their daily production targets. Many workers reported that they 'often' or 'always' meet their production targets. This could be because of a combination of factors such as modern technology, skilled workers and a better working environment, including an environment-friendly environment (Table 8.5).

Workers in large factories also tend to have lower absence rates due to sickness, while workers in small and medium-sized and micro factories have higher absence rates due to illness (Table 8.6). While the sickness cannot be attributed solely to the workplace environment, it may have some connections.

Table 8.5: How Often Do Workers Meet their Daily Production Target

Response	Large factories	Small and medium factories	Micro factories	Total
Never (N)	0	1	1	2
(%)	(0.00)	(0.86)	(0.44)	(0.33)
Rarely (N)	2	1	6	9
(%)	(0.78)	(0.86)	(2.64)	(1.50)
Sometimes (N)	83	23	131	237
(%)	(32.42)	(19.83)	(57.71)	(39.57)
Often (N)	78	29	32	139
(%)	(30.47)	(25.00)	(14.10)	(23.21)
Always (N)	93	62	57	212
(%)	(36.33)	(53.45)	(25.11)	(35.39)
Total (N)	**256**	**116**	**227**	**599**

Source: Calculated from the CPD Green Transition Study survey data.

Workers in large factories also tend to have lower absence rate due to sickness, while workers in small and medium-sized, and micro factories have higher absence rates due to illness (Table 8.6). While the sickness cannot be attributed solely to the workplace environment, it may have some connections.

Table 8.6: Workers' Absence in the Last Month Due to Sickness

Factory type	Yes N/ (%)	No N/(%)	Total N/(%)
Large factories	210	212	422
	(49.76)	(50.24)	(35.88)
Small and medium factories	190	119	309
	(61.49)	(38.51)	(26.28)
Micro factories	237	208	445
	(53.26)	(46.74)	(37.84)
Total	637	539	1176
	(54.17)	**(45.84)**	**(100)**

Source: Calculated from the CPD Green Transition Study survey data.

Among the surveyed workers, 99.57 per cent of those working in large factories believe green practices benefit them. Around 90.55 per cent of the workers in small and medium-sized factories and 90.01 per cent in micro factories share the same belief. The workers reported reduced health hazards, medical costs, and improved productivity as the top three benefits of green practices within the factories. More than 80 per cent of the owners and managers opined that the production efficiency of the workers would increase due to the green transition of their factories. It was mentioned during the KIIs that green factories prioritise the health and safety of their employees by implementing measures such as improved air quality, reduced noise pollution, and sustainable practices. This leads to a more pleasant and productive work environment and reduced absenteeism and turnover rates.

9. BARRIERS FOR GREENING FACTORIES

The present study identifies four major types of barriers that factories in the textile and RMG sectors face while embarking on their journey towards green transition. These are: (i) policy and regulatory barriers, (ii) institutional barriers, (iii) factory-level barriers, and (iv) market-related barriers. These barriers are briefly discussed below.

9.1 Policy and Regulatory Barriers

- **Lack of harmonisation in policies and regulations:** The Government of Bangladesh has many initiatives in its national development policy and plans and has also enacted several laws and regulations related to climate change mitigation and adaptation and pollution control (GED, 2018; MoEFCC, 2021; MoEFCC, 2022). However, specific policy options and strategic direction for managing climate and environmental challenges in a way that harmonises the need for a green transition of the industrial sector with economic growth are missing (GED, 2020b).

  For instance, the recently published Climate Prosperity Plan (CPP) recognises the Leadership in Energy and Environmental Design (LEED) certification as a green accreditation for export-oriented industries like jute, leather, textiles, and information technology (IT) services. Within the framework of the green export programme, the plan has set a goal of achieving 100 per cent LEED certification for strategically significant export industries by 2030. However, this target does not align with other government plans, such as the Perspective Plan of Bangladesh (2021-2040) and the National Adaptation Plan (2023-2050). Furthermore, it is important to note that LEED certification alone does not encompass all the aspects of making industries more environment-friendly, as it may not be suitable or necessary for certain sectors, such as textiles. Also, during the KIIs with brands and buyers, it was mentioned that there is a mismatch between the LEED-centric push by the government and the standards demanded by the buyers. Therefore, there is a need for greater harmonisation and consistency among policies.

  Also, there is an obvious absence of regulatory mechanisms within environmental and industrial policies to address critical concerns related to surface and groundwater management, land management as well as the

safe disposal of hazardous and toxic waste. To illustrate, there is currently no established pricing policy for the industrial utilisation of groundwater. The consequent unrestricted use of groundwater is leading to a significant decrease in surface water levels in numerous densely industrialised areas, including Dhaka, Gazipur, and Mymensingh. The need for coordination and the implementation of regulatory tools to effectively confront these environmental and industrial challenges cannot be overstated.

- **Absence of specific environmental goals in policies and regulatory frameworks:** Bangladesh's textile and RMG industry needs more specific and defined goals in policies and regulatory frameworks to adopt sustainable practices. The existing environmental monitoring and regulatory framework needs to clearly define goals for factories to follow sustainable practices. The absence of specific environmental goals has led to insufficient implementation of regulations, for instance, the inadequate implementation of an environment protection surcharge. In the Eighth Five-Year Plan (8FYP), a goal was set to implement the polluter pays principle in 40 per cent of cases by 2025 and 100 per cent of cases by 2050. Nevertheless, there is no specific mention of the methods or mechanisms through which this goal will be attained.

  Additionally, more policy support and incentives for encouraging investment in large-scale renewable energy generation must be provided. These factors pose significant obstacles to a smooth transition from traditional to renewable energy, impeding progress in the green transition of the textile and RMG sectors. Improving sustainable practices can be enhanced by the presence of green practice regulations tailored to small, medium, and micro-sized factories.

- **Regulatory and policy uncertainty for energy security:** Regulatory and policy uncertainty for energy security presents a significant challenge for factories when it comes to planning and making long-term investments in green energy sources. This uncertainty is especially pertinent when it involves regulations that prioritise traditional fossil fuel dominant energy mix, as it can discourage factories from venturing into green energy.

  In the context of Bangladesh, the historical reliance on fossil fuels has been a defining characteristic of its energy sector. Fossil fuels, including coal, natural gas, and oil, have traditionally played a central role in meeting the country's energy demands. Regulations and policies designed to

support and incentivise these industries may take the form of subsidies that lower the cost of fossil fuel, tax benefits that reduce the financial burden on these industries, or environmental standards that may not be as stringent as those promoting greener alternatives.

In a policy and regulatory environment that favours fossil fuels, factories operating within this framework might have limited motivation to invest in cleaner and more sustainable technologies. The immediate financial advantages offered by the current system can overshadow the potential benefits of transitioning to green energy solutions. This hesitancy to shift towards greener technologies persists even when these alternatives have the potential to be more cost-effective and environmentally responsible in the long term.

The energy mix argument underscores that as long as policies and regulations heavily favour fossil fuels, the transition to green energy solutions may face resistance, as the financial incentives in place can make fossil fuels appear more economically viable in the short term. To facilitate this transition, it is essential for the government and regulatory bodies to rebalance incentives and prioritise environmentally sustainable energy sources.

9.2 Institutional Barriers

- **Weak regulatory, management, monitoring systems, and enforcement:** Existing useful laws and regulations remain less effective owing to weaknesses in regulatory, management, monitoring systems and enforcement. Factories often fail to comply with these rules and regulations because of lax enforcement and awareness regarding environmental compliance requirements. As an example, the Department of Environment (DoE) is responsible for enforcing the legal requirements stipulated in the Environmental Conservation Act of 1995 (ECA). This requirement mandates that all applicable industrial facilities must install ETPs to treat their wastewater to meet specified standards before discharging it into the surrounding environment. Nevertheless, the enforcement of this mandate presents significant challenges due to a shortage of personnel and a lack of technical expertise within the agency concerned.

As a result, many factories go unchecked, and violations often go unnoticed. Even when violations are identified, penalties for non-compliance may be relatively minor or inconsistently applied. This can lead some factory owners to view the penalties as a cost of doing business rather than an incentive for sustainability. Consequently, numerous factories engaged in processes such as washing and dyeing (classified as 'red' industries) often show reluctance in operating their ETPs effectively, which results in degradation of environment.

According to the KIIs, owners and managers of most of the factories think that the government rules and regulations could be a significant factor in organisations' green management and these rules need to be stringent in the coming days. They were also of the opinion that weak implementation of the policies, rules, and regulations slow down the green transition process. Also, weakness in implementation creates an uneven playing field. Those complying feel they are losing out in competition, thus discouraging compliance.

- **Lack of coordination among government agencies:** The lack of coordination and cooperation among various ministries and government agencies is hindering the formulation and implementation of synergistic green industrial policies (Hannan & Aigbogun, 2021). As an example, the management of solid and hazardous waste in Bangladesh involves the participation of multiple government entities, including the DoE, the Ministry of Industries (MoI), the Ministry of Commerce (MoC), and local city corporations. However, there is a notable absence of coordination among these agencies when it comes to the disposal and management of solid and hazardous waste.

  For instance, numerous garment and textile factories are located along the eastern banks of Turag River, which falls under the jurisdiction of the Dhaka North City Corporation (DNCC). Currently, the river is suffering because of the gradual buildup of industrial and other waste. The Bangladesh Inland Water Transport Authority (BIWTA), responsible for maintaining the river's navigability, has faced challenges in terms of managing the available water resources and surrounding environment due to the lack of cooperation between these two agencies. This lack of coordination is also evident among other agencies, primarily due to overlapping mandates.

9.3 Factory Level Barriers

- **Lack of information and awareness:** Access to information is crucial in driving firms' green investment decisions. However, many enterprises need more awareness and knowledge to integrate sustainable practices into their business models. The certification process can be particularly challenging due to a lack of information. A considerable lack of awareness has been identified from the survey results. Only 17.50 per cent of the owners and managers from the 377 non-green certified factories knew about green certifications. Further, disaggregation within these factories reveals that owners and managers of large factories are considerably more aware (80.70 per cent) when compared to small and medium factories (15.03 per cent) and micro factories (3.00 per cent).

  During the FGDs, export-oriented large factories were portrayed as having a good understanding of the greening concept and environmental compliance issues. At the same time, the need for education and training pertaining to green practices for the smaller factories was also recognised. When it comes to factory employees, 71.13 per cent of supervisors reported that they are aware of green or environment-friendly practices in factories. The corresponding figure for workers was 78.99 per cent. In general, a higher level of awareness is observed in large factories compared to small and medium, and micro factories.

  While the overall level of awareness is encouraging, it was mentioned during the FGDs that workers' understanding of green activities was primarily limited to physical and visual aspects of the workplace rather than the broader environmental impact of their work. Fine-tuning of these perceptions and promoting greater awareness of the benefits of sustainable practices may be vital in encouraging broader adoption of green technologies.

- **Finance-related constraints:** Access to finance is one of the most cited barriers for factories seeking environmental certification or adopting green practices. Initiatives such as obtaining green certification, retrofitting facilities, implementing sustainable practices, and adopting green technologies often require high upfront costs, which can deter factories from embracing green initiatives due to the perceived financial risk. Notably, the cost of obtaining various green certifications for different

buyers is relatively high, which remains a challenge for many factories. Lack of funds, especially for small, medium, and micro-sized factories or factories in Tier 2 and 3, may put them in a disadvantageous situation where the brands/ buyers may avoid them for being environmentally non-compliant. Indeed, as identified by the survey, investment in sustainable practices by these types of factories is rather limited. As Figure 7.6 bears out, on average, micro factories spent only BDT 0.16 million on green investment during the last five years. For small and medium-sized factories, the corresponding figure was BDT 1.37 million. Such an amount of investment is insufficient compared to the actual investment required for the green transition of these factories (Shajahan et al., 2023).

Furthermore, these factories face obstacles when trying to access existing financial schemes due to their limited capacity to provide collateral. When these businesses were initially established, many had to secure loans using whatever collateral they had. Consequently, additional

investments for environmental compliance become challenging as this entails further collateral requirements. While the Bangladesh Bank has introduced the 'Refinance Scheme for Green Products/Projects/ Initiatives', accessing this scheme entails navigating a complex process such as developing a project, applying for a loan from commercial banks, implementing projects and submitting the project progress report to avail the refinance scheme from Bangladesh Bank. This lengthy process is financially risky and challenging for these factories due to their limited capabilities and knowledge.

The perceived financial risk associated with these investments can deter factories from embracing green initiatives, resulting in missed opportunities for cost savings, increased efficiency, and better environmental performance.

- **Limited capacity and capability of factories:** The wide variation in the capacity of factories to undertake green initiatives is reflected in the embeddedness of environmental sustainability issues in their policies and workforce. The survey data shows that large factories were performing better in terms of considering environmental sustainability in their strategic objectives, having sustainability-related policies, and identifying environmental protection as part of corporate social responsibility. Other factories lag considerably behind when it comes to these aspects.

  Many large factories have appointed a designated person to work on sustainability (or even a 'Head of Sustainability') along with a separate environmental compliance manager/ officer. In the case of smaller factories, the situation is quite dismal. As Table 6.1 illustrates, these types of factories consistently trail behind in terms of integrating environmental initiatives into their policies and strategic frameworks. Consequently, only a small fraction of factories within these categories have set targets aimed at reducing energy, water, and carbon footprints (Figure 7.1). The primary reason behind this lag in incorporating green strategies is the limited capacity of these factories.

  During the KIIs, it was acknowledged that the majority of the workers did not have sufficient knowledge regarding the greening initiatives. It was mentioned that there is a shortage of skilled human resources when it comes to maintaining greening-related technologies. The owners and managers often need to rely on foreign expertise when importing

and installing state-of-the-art machinery in their factories. The FGDs highlighted the importance of education and training for workers to understand the environmental impacts of their work and the machinery they use.

- **Operational barriers:** Another set of barriers that hinders the adoption of green initiatives are operational barriers, such as the difficulty of greening in rented infrastructure or factories which are already established. Factories operating within rented infrastructure may encounter considerable hurdles when attempting to make substantial investments in green initiatives. This difficulty arises from the inherent need for more control over the building and its systems to undertake significant green modifications. In rented spaces, the degree of control and authority over structural changes and technology upgrades can be limited, thus impeding the adoption of comprehensive green practices.

  Moreover, factories that are already established may struggle to meet the requirements for green certification and environmentally sustainable standards. The retrofitting of older facilities to meet these standards can be logistically, financially, and operationally challenging. Adapting existing infrastructure to comply with new environmental regulations and standards often necessitates substantial investments in technology, equipment, and facility modifications, presenting a formidable barrier to the adoption of green initiatives.

- **Challenges for obtaining electricity and water from sustainable sources:** The factories face considerable challenges in terms of obtaining electricity and water from sustainable sources. This is particularly pronounced for micro and small and medium-sized factories. As the survey data points out, micro and small and medium-sized factories are heavily reliant on the grid for electricity supply (Figure 7.4). In this connection, it must be mentioned that the production of national grid electricity in Bangladesh is heavily dependent on traditional fossil fuels—reaching a share of more than 80 per cent (Table A9.1). The reason behind micro, and small and medium sized factories' reliance on grid electricity is that these types of factories are unable to install solar energy systems as the installation process requires a substantial amount of investment and technical capacity.

Moreover, reducing water footprint is a big challenge for micro, and small and medium sized factories. These factories are heavily dependent on groundwater for their water consumption. Around 93 per cent of total water consumption by micro factories in a month comes from groundwater, whereas the corresponding share for small and medium sized factories is around 87 per cent (Table A9.2). Excessive use of groundwater depletes its level, which poses a serious threat to the environment (Mamun et al., 2022).

9.4 Market-related Barriers

- **Lack of market-driven incentives:** The absence of market-driven incentives can pose a significant barrier to firms adopting sustainable practices. The survey conducted for this study found that firms were primarily motivated by internal factors and market-driven incentives rather than external factors such as regulatory pressure. Thus, the lack of incentives can demotivate firms from transitioning to sustainable practices. For example, the absence of premium prices for green products is a significant barrier to green transition in the textile and RMG sector. This discourages factories from investing in green production processes, as they may not see any additional revenue from such investments. Even if the factories are green certified, entrepreneurs may make less profit since the prices remain the same.

- **Lack of information and expertise on green technologies:** A disparity in access to information about green technologies can also hinder factories from developing their technological knowledge and capabilities. Insufficient information and awareness regarding green technologies and best practices can curtail a factory's capacity to embrace environment-friendly technologies. This information gap is more pronounced in small and medium-sized as well as micro-sized factories in comparison to their larger counterparts. For instance, only 15.03 per cent of the small and medium factories have knowledge concerning green certification and the corresponding share for micro factories is even lower - only 3.00 per cent (Figure 6.2). The KIIs and FGDs revealed that these factory groups lack essential resources to understand the process of greening and attaining certification. Besides, these micro, and small and medium-sized factories

lack awareness regarding the benefits of implementing green practices in their production processes.

Additionally, the need for green technology varies among factories of different sizes. Consequently, the management of these factories often lacks clarity about where and how to obtain pertinent information on green technology. Moreover, some factories require assistance in identifying suitable green materials and technologies to implement sustainable practices, thereby compounding the challenges associated with making the transition.

10. CONCLUSIONS AND RECOMMENDATIONS

The findings offer valuable insights into various facets of these industrial establishments. These factories, with a notable presence in the RMG and textile industries, demonstrate a trend of growth between 2000 and 2010. Factory sizes vary significantly, with a majority falling in the micro category. Among large factories, green certification awareness varies, and some non-green certified factories embrace sustainability to meet environmental regulations and buyer expectations. A subset of factories operates within the EPZs. Tier-wise distribution within the RMG factories reveals varied characteristics.

Motivations for green certification encompass self-drive and market demands, while government regulations exert a weaker influence. Training in sustainability is more prevalent in large factories, and the adoption of green policies is higher among them, as well. Notably, large factories make substantial investments in green initiatives.

Areas of investment include energy, water, air, and waste management, among others. Utility consumption patterns reveal disparities, with smaller factories relying more on grid electricity. Worker demographics vary by gender and age, with workers in large factories demonstrating higher productivity and lower sickness-related absenteeism rates compared to their counterparts in smaller factories. These findings collectively depict the diverse landscape of factories, their sustainability efforts, and the characteristics of their workforce.

In view of the analyses based on the primary data collected from the survey, KIIs, and FGDs, this study makes a number of recommendations for securing green transition in the textile and RMG sector in Bangladesh. These recommendations have been clustered under five broad themes viz. policy and regulatory measures, economic incentives, green finance, awareness and knowledge sharing, and skills and capacity development. In this connection, it must be noted that these five themes are not mutually exclusive and may have considerable overlaps among them.

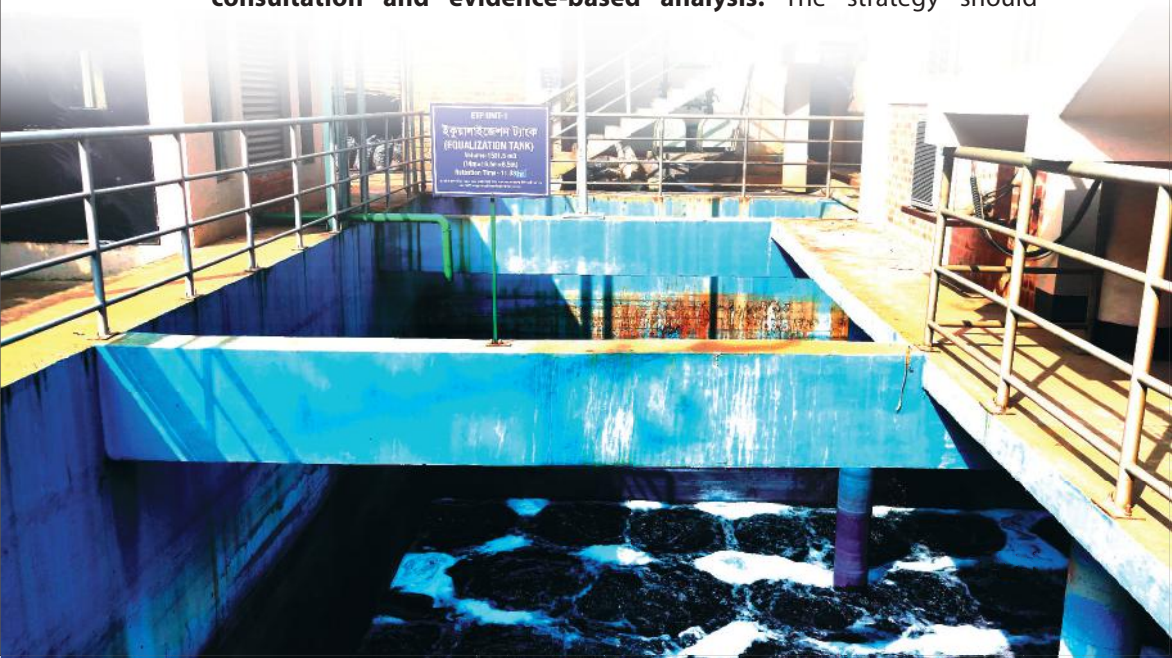
The present study also identifies the key actors that are relevant to each of the recommendations (Table A10.1 in annex). Given the continuous effort

required to secure the green transition of the textile and RMG sector of the country, a multistakeholder approach has been considered. As can be seen from the discussion later, government agencies play a central role in implementing these recommendations. From a sustainability perspective, this is justified as the non-state initiatives often end up being short-term and project-centric in nature. Additionally, the buyers, industry associations, and international development partners also have a critical role to play in the efforts towards securing green transition. As industry insiders and financers, they can contribute substantially towards green finance, awareness and knowledge sharing, and skills and capacity development. Finally, academia and think tanks can provide their support as knowledge actors in the efforts towards green transition.

10.1 Policy and Regulatory Measures

The task of securing green transition in the textile and RMG sector requires considerable effort in the policy domain. Given the multidimensional nature of the issue and the number and types of stakeholders involved, effective coordination among these players is critical so that policies are not contradictory to each other, and efforts are synergistic. Specific actions that can be taken in this regard include:

- **Developing a comprehensive strategy that covers all aspects of a green transition for the textile and RMG sector based on stakeholder consultation and evidence-based analysis:** The strategy should



include short and long-term goals, indicators, targets, timelines, roles, responsibilities, budgets, and monitoring mechanisms. The Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Industries (MoI) can take the lead in developing this strategy. Pertinent government agencies, including the Ministry of Commerce (MoC), Ministry of Finance (MoF), Bangladesh Bank (BB), Ministry of Planning (MoP), and the Prime Minister's Office (PMO), need to be closely involved and consulted in the formulation process. The industry associations, buyers, worker representatives, academia, and think tanks must be consulted and be made part of the strategy development process. These actors can significantly contribute to the evidence-generation process required for developing a comprehensive strategy.

- **Creating a task force/committee to review policies and regulations related to the green transition in the textile and RMG sector:** This will help identify any ambiguities or contradictions and take timely actions to address them, promoting a conducive environment for green transition. Government agencies such as MoEFCC, MoI, MoC, MoF, BB, and MoP should be integral parts of the proposed task force/committee. Besides, engagement with the industry and other stakeholders, including academia and think tanks, to gather feedback and suggestions on policies and regulations will facilitate a comprehensive and participatory review process.

- **Developing a common framework for green standards and certification procedures based on international best practices and market requirements:** As mentioned, the lack of a standard definition of greening results in various operational difficulties for the firms. To this end, government agencies such as MoI, MoEFCC and non-state actors, including industry associations, buyers, academia, and think tanks, can collaborate towards developing a common framework for green standards and certification. All firms would adhere to the same environmental benchmarks with a uniform standard. Moreover, a uniform certification procedure would make it easier and less costly for factories to obtain green certifications required by various buyers, eliminating the need to undergo multiple audits or certifications.

- **Providing assistance to obtain green-related certifications:** Technical assistance and guidance could be provided to factories to help them

implement green standards and certification procedures, such as conducting audits, improving energy efficiency, reducing waste, and using renewable energy sources. To this end, state actors including the MoI and Sustainable and Renewable Energy Development Authority (SREDA), and the industry associations and buyers can take the lead role. Furthermore, firms could be incentivised to adopt green standards and certification procedures by offering preferential access to buyers, financing, tax breaks, or subsidies.

10.2 Economic Incentives

Factories currently investing and willing to invest in promoting green measures, technological development, productivity enhancement, skill development, and higher welfare for workers should be supported through economic incentives. Correspondingly, the following initiatives could be taken:

- **Providing market-driven incentives, such as tax breaks and subsidies, for factories that invest in sustainable production processes:** These incentives should be aligned with the sectoral climate goals and environmental standards. Tax incentives may be provided to small and medium factories that want to import ETPs and obtain green certificates. The MoI, MoF, and MoC need to collaborate to devise instruments to incentivise investments in sustainable production processes.

- **Withdrawing fiscal support to the polluters:** Fiscal support to polluting industries and fossil fuel-based power generation should be withdrawn and transferred to clean technologies. The textile and RMG factories investing in green production processes should have access to those funds. Given the contentious nature of the initiative, the MoI, MoF, and Ministry of Power, Energy and Mineral Resources (MoPEMR) will need to play a strong leadership role.
- **Providing premium prices for products from green factories:** As mentioned earlier, premium prices are expected to encourage more factories to engage in greening initiatives. Furthermore, such an initiative will be able to compensate for the huge initial investment required for greening the factories. The buyers will have to play the lead role in this regard. The industry associations will need to continuously pursue this agenda. The MoI can act as the interlocutor in case of a possible deal or agreement between the buyers and the industry.

10.3 Access to Green Finance

Both the state and non-state actors can contribute to ensuring easy access to green finance through soft loans, grants, and seed funds. The relevant departments of the government and industry associations should disseminate information on the availability of funds. Some actions that can be taken in this regard include:

- **Creating a comprehensive system for accessing green financing programmes:** Easy access to green finance can be facilitated by creating an online portal for factories that want to invest in sustainable practices. The ICT Division of the government can develop the portal and may include all relevant information pertaining to green finance opportunities

and how to access them. Furthermore, increasing the allocation of funds for green financing programmes, developing a help desk to assist in accessing green financing, streamlining the application process, limiting the documentation requirement, and reducing the time required for approval will be greatly beneficial for factories interested in green financing. The MoF, BB, and MoI can work jointly to this end.

- **Establishing a credit guarantee scheme to enable smaller factories to access sustainable financing options:** Such options may include providing guarantees or insurance for SMEs that face difficulties in obtaining loans for green investments. The Bangladesh Bank and commercial banks will have an important role in making green funds available to these firms. The buyers and international development partners can contribute financially to these funds, while the MoI can be an interlocutor.

10.4 Awareness and Knowledge Sharing

All textile and RMG sector factories should have access to information on greening their outlets. Awareness of the meaning and implications of greening and ways to be green is needed. Information on green transition should be easily available to owners, officials, workers, and trade union members. Specific actions that can be taken in this regard are:

- **Making information on greening publicly available:** The government, keeping in mind its climate-related goals and commitments, should ensure that information on effective green management, practices, and technologies is readily available to all interested parties. The MoEFCC and the MoI can be instrumental in this regard. The goal of information sharing can be achieved by establishing a central database or platform for disseminating information on sustainable practices. The ICT Division can develop such a platform. Non-government entities such as industry associations, academia, and think tanks should also be allowed to contribute to this platform. By making this information publicly available, firms can gain access to the necessary knowledge and tools required to transition towards sustainable practices.

- **Conducting workshops, training sessions, and campaigns to foster changes in values and attitudes toward sustainability:** The government, in collaboration with the buyers, industry associations, and international development partners, should organise regular workshops and training sessions to raise industry stakeholders' awareness of the benefits of sustainable practices. These sessions will provide participants with a comprehensive understanding of sustainable practices, their benefits, and the steps required to implement them. Among the government agencies, the MoEFCC and the MoI should take the lead in this case to ensure the continuation and sustainability of the initiatives. Launching campaigns to promote sustainable practices and their importance can also be beneficial in spreading awareness. The Ministry of Information and Broadcasting (MoIB) and the media can be instrumental.

- **Providing technical guidance and support to mitigate knowledge gaps:** The government, in collaboration with the buyers, associations, international development partners, and academia, should offer technical guidance and support to assist factories in adopting sustainable practices and addressing knowledge gaps. This can include assistance in obtaining green certifications, identifying cost-saving opportunities for factories to transition to sustainable practices, and helping them develop sustainable business models.

10.5 Skills and Capacity Development

There should be special training and workshops for the factories, particularly the small and medium enterprises, to raise their awareness and encourage them to undertake green measures. Women's participation in such training must be ensured. These can be organised by industry associations with support from academia and think tanks and be funded by buyers and international development partners. Training programmes for the firms on the source of finance, how to access and how to utilise those funds should be organised by relevant ministries and departments, associations, and the central bank, Bangladesh Bank. Training should be an ongoing process since rules and regulations often change, and all stakeholders related to the sector, including the owners, managers, trade unions, and workers, should be made aware of such changes. Hence, government agencies, including the

National Skills Development Authority (NSDA) and the MoI, can take the lead in coordinating. Some initiatives in this regard could be:

- **Increasing the availability of skilled human resources:** This can be achieved via developing and expanding apprenticeship and mentorship programmes in green industries, developing partnerships with private sector organisations to provide training and certification programmes, and incentivising individuals and businesses to participate in green skills training programmes. The NSDA, MoI, and industry associations can jointly work on this issue while buyers and international development partners can contribute financially.

- **Establishing a green skills development fund:** This will support firms in training their workers on energy efficiency, waste management, and circular economy. A levy on high-carbon energy sources or a portion of the green incentives for firms could finance the fund. The MoEFCC, MoI, MoF, BB, and industry associations can jointly work towards initiating and managing this fund. International development partners and buyers can also contribute to this fund.

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ANNEXS

Table A4.1: Chronological List of Selected Climate, Environment, and Energy-related Plans and Policies in Bangladesh

Year	Policies	Priority focus area
1992	• Environment Policy	Environment
1995	• The Bangladesh Environment Conservation Act, 1995 • National Environment Management Action Plan	Environment
1997	• The Environment Conservation Rules, 1997	Environment
1998	• National Policy for Safe Water Supply and Sanitation • National Fisheries Policy	Climate, Environment
1999	• National Water Policy	Environment
2001	• National Land Use Policy • National Water Management Plan, 2001	Climate, Environment
2003	• Bangladesh Energy Regulatory Commission Act, 2003	Energy
2004	• National Energy Policy	Energy, Environment
2005	• National Energy Policy (Updated) • National Adaptation Programme of Action (NAPA)	Climate, Environment, Energy
2008	• Renewable Energy Policy of Bangladesh • Guide for Assessment of Effluent Treatment Plants	Environment, Energy
2009	• Bangladesh Climate Change Strategy and Action Plan, 2009	Energy
2010	• Quick Enhancement of Electricity and Energy Supply (Special Provisions) Act, 2010 • National 3R Strategy for Waste Management	Climate, Environment, Energy
2012	• The Sustainable and Renewable Energy Development Authority Act, 2012 • Perspective Plan of Bangladesh 2010-2021	Climate, Environment, Energy

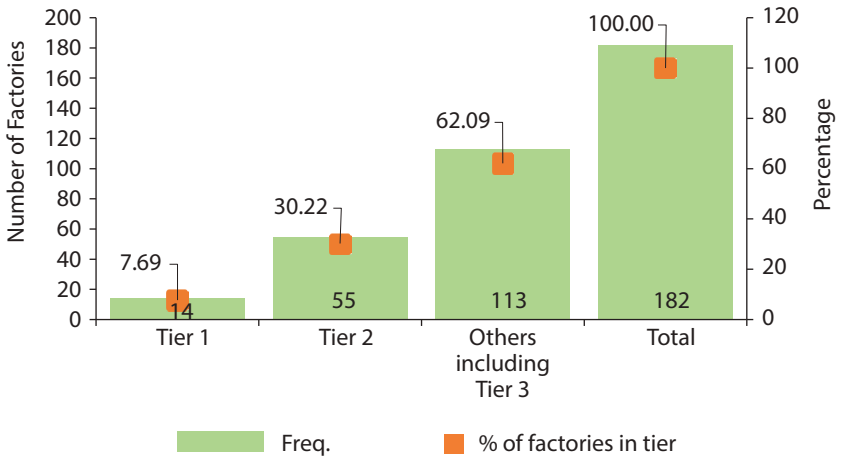
(Table A4.1 Contd.)

(Table A4.1 Contd.)

Year	Policies	Priority focus area
2013	• National Sustainable Development Strategy (NSDS) (2010-2021) • Country Action Plan for Clean Cookstoves, 2013 • Bangladesh Water Act, 2013 • Action Plan for Energy Efficiency and Conservation • Bangladesh Climate Change and Gender Action Plan, 2013	Climate, Environment, Energy
2014	• Bangladesh Climate Fiscal Framework • National Aquaculture Development Strategy and Action Plan (2013–2020)	Climate, Environment
2015	• Draft Environment Policy, 2015	Environment
2016	• Energy Efficiency and Conservation Master Plan up to 2030 • Draft National Agriculture Extension Policy, 2016	Energy, Environment
2017	• Climate Protection and Development: Budget Report, 2017-18	Climate
2018	• Bangladesh Delta Plan 2100 • National Environment Policy • Power and Energy Sector Strategy Paper (SSP) • Electricity Act, 2018 • Roadmap and Action Plan for Implementing Bangladesh NDC Transport, Power and Industry Sectors • Net Metering Guidelines, 2018	Environment, Energy
2020	• National Solar Energy Action Plan (2021-2041) • Building Energy Efficiency and Environment Rating (BEEER) for Design and Construction of Buildings • Guidelines for the Grid Integration of Solar Irrigation Pumps-2020 • Perspective Plan of Bangladesh 2021-2041	Climate, Environment, Energy
2021	• Climate Prosperity Plan • National Solar Energy Roadmap (2021-2041)	Climate, Environment

Source: Authors' compilation.

Figure A6.1: Tier-wise Distribution of Surveyed RMG Factories



Source: Calculated from the CPD Green Transition Study survey data.

Note: Share of factories in tier is shown in the right vertical axis.

Table A6.1: Distribution of Factories by Product Type

RMG			Textile		
Types	**Number of factories**	**Percentage**	**Types**	**Number of factories**	**Percentage**
Woven garments	73	40.11	General fabric manufacturing	168	76.02
Mixed garments	44	24.18	Mixed factories	24	10.86
Knit garments	40	21.98	Others	18	8.14
Others	14	7.69	Textile product	6	2.71
Sweaters	6	3.30	Yarn manufacturing	5	2.26
Jacket, blazers, etc.	5	2.75	-	-	-
All	182	100.00	All	221	100.00

Source: Calculated from the CPD Green Transition Study survey data.

Table A6.2: Other Environmental Certificates

Name of the certificates	Freq.	Per cent
BCI	5	6.58
BSCI	6	7.89
Environment Clearance Certificate	7	9.21
GOTS	7	9.21
OCS	13	17.11
RCS	1	1.32
GRS	4	5.26
Higg Index	1	1.32
OEKO -TEX	13	17.11
ISO 14001	1	1.32
OHS	1	1.32
SGS	1	1.32
Sedex	14	18.42
ZDHC	1	1.32
Step octax	1	1.32
Total	**76**	**100.00**

Source: Calculated from the CPD Green Transition Study survey data.

Note: Classification was not created since only large firms have the certificates.

Table A7.1: Factors Influencing Factories' Targets Related to Reducing Energy Consumption

Variable	Coef.	St.Err.	t-value	p-value	Sig
Environmental sustainability as factories' strategic objectives	0.15	0.28	0.56	0.58	
Policies for promoting environmental sustainability	0.47	0.25	1.85	0.06	*
Designated person for working on sustainability issues	0.28	0.37	0.77	0.44	
Environmental compliance and sustainability manager	0.95	0.37	2.62	0.01	***
Providing training to employees regarding green practice	0.41	0.021	1.99	0.05	**
Constant	-0.73	0.08	-8.85	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

Table A7.2: Factors Influencing Factories' Targets Related to Reducing Water Consumption

Variable	Coef.	St.Err.	t-value	p-value	Sig
Environmental sustainability as factories' strategic objectives	-0.06	0.32	-0.19	0.85	
Policies for promoting environmental sustainability	0.89	0.27	3.28	0.00	***
Designated person for working on sustainability issues	0.31	0.37	0.86	0.40	
Environmental compliance and sustainability manager	0.99	0.37	2.71	0.01	***
Providing training to employees regarding green practice	0.60	0.22	2.74	0.01	***
Constant	-1.25	0.09	-12.59	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.
Note: *** p<.01, ** p<.05, * p<.1

Table A7.3: Factors Influencing Factories' Targets Related to Reducing CO_2 Emission

Variable	Coef.	St.Err.	t-value	p-value	Sig
Environmental sustainability as factories' strategic objectives	0.48	0.33	1.47	0.14	
Policies for promoting environmental sustainability	0.26	0.32	0.81	0.42	
Designated person for working on sustainability issues	0.96	0.33	2.94	0.00	***
Environmental compliance and sustainability manager	0.44	0.35	3.26	0.00	***
Providing training to employees regarding green practice	-0.06	0.28	-0.19	0.85	
Constant	-1.50	0.11	-13.22	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.
Note: *** p<.01, ** p<.05, * p<.1

Table A7.4: Investment Decision on Energy Related Technology

Variable	Coef.	St.Err.	t-value	p-value	Sig
Energy conservation	0.46	0.18	8.25	0.00	***
Renewable energy	0.58	0.23	2.53	0.01	**
Building level energy meter	0.18	0.40	4.21	0.00	***
Constant	-1.74	0.16	-10.92	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

Table A7.5: Investment Decision on Water Conservation Technology

Variable	Coef.	St.Err.	t-value	p-value	Sig
Building level water meter	0.63	0.32	7.29	0.00	***
Constant	-0.89	0.08	-11.30	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

Table A7.6: Source of Water in the Factories

Main source of water in the factory	Freq.	Per cent
Ground water	364	90.32
WASA/supply	31	7.69
River	2	0.50
Others	6	1.49
Total	**403**	**100.00**

Source: Calculated from the CPD Green Transition Study survey data.

Table A7.7: Investment Decision on Air Pollution

Variable	Coef.	St.Err.	t-value	p-value	Sig
Air pollution control technology	0.85	0.18	4.83	0.00	***
Dust control technology	0.92	0.17	5.28	0.00	***
Constant	-0.98	0.09	-11.10	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.

Note: *** p<.01, ** p<.05, * p<.1

Table A7.8: Investment Decision on Waste Management Technology

Variable	Coef.	St.Err.	t-value	p-value	Sig
Solid waste management technology	0.97	0.31	3.17	0.00	***
Wastewater management	0.47	0.25	6.51	0.00	***
Technology for reducing chemical waste	0.59	0.58	1.02	0.30	
Technology related to reuse and reduction of waste	-0.05	0.30	-0.17	0.86	
Constant	-0.77	0.08	-10.14	0.00	***

Source: Calculated from the CPD Green Transition Study survey data.
Note: *** p<.01, ** p<.05, * p<.1

Table A7.9: Investments, Loans, and Interest Rate

Investments, loans, and interest rate	Large factories			Small and medium factories			Micro factories		
	Yes (%)	No (%)	Avg. amount/ Avg. interest rate (%)	Yes (%)	No (%)	Avg. amount/ Avg. interest rate (%)	Yes (%)	No (%)	Avg. amount/ Avg. interest rate (%)
Total investment in last 5 years	100.00	0.00	187,060,870.98	58.82	41.18	8,391,080.00	54.89	45.11	989,139.53
Take bank loans for making investment	56.63	43.37	12.38	28.00	72.00	9.21	20.93	79.07	8.63
Green investment only in last 5 years	91.57	8.43	78,067,209.04	20.00	80.00	1,371,176.47	13.19	86.81	162,258.06
Take bank loans for making green investment only	28.29	71.08	7.08	3.53	96.47	9.33	1.28	98.72	8.67
Share of green investment in total investment (%)	-	-	36.98	-	-	44.84	-	-	53.99

Source: Calculated from the CPD Green Transition Study survey data.

Table A8.1: Distribution of Respondents by Factory Size and Gender

Category		RMG		Textile	
		Female worker	Male worker	Female worker	Male worker
Large factories	n	796	556	75	202
	%	58.88	41.12	27.08	72.92
Small and medium factories	n	101	430	78	492
	%	19.02	80.98	13.68	86.32
Micro factories	n	116	566	63	1066
	%	17.01	82.99	5.58	94.42

Source: Calculated from the CPD Green Transition Study survey data.

Table A9.1: Current Electricity Generation Mix (As of April 2024)

Fuel/Resource	Installed capacity (MW)	Share (Per cent)
Coal	5412	18.48
Gas	11,708	39.98
HFO	6,492	22.17
HSD	490	1.67
Imported	1,160	3.96
Renewable	1,225	4.18
Captive	2,800	9.56
Total	**29,287**	**100.00**

Source: SREDA (2024).

Table A9.2: Sources of Water Consumption for Micro, Small and Medium Factories

Main source of water consumption in the factory	Micro factories	Small and medium factories
Ground water	92.34	87.06
Wasa/supply	5.11	11.76
River	-	1.18
Other sources	2.55	-

Source: Calculated from the CPD Green Transition Study survey data.

Table A10.1: Suggested Actions and Relevant Ministries/Agencies

Actions Required	Responsible Ministries/ Agencies	Timeline
Policy and Regulatory Measures		
Developing a comprehensive strategy that covers all aspects of a green transition for the textile and RMG sector based on stakeholder consultation and evidence-based analysis	Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Industries (MoI), Ministry of Commerce (MoC), Ministry of Finance (MoF), Bangladesh Bank (BB), Ministry of Planning (MoP), and the Prime Minister's Office (PMO)	Short and long-term
Creating a task force/ committee to review policies and regulations related to the green transition in the textile and RMG sector	Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Industries (MoI), Ministry of Finance (MoF), Bangladesh Bank (BB), and Ministry of Planning (MoP)	Long-term
Developing a common framework for green standards and certification procedures based on international best practices and market requirements	Ministry of Environment, Forest and Climate Change (MoEFCC) and Ministry of Industries (MoI)	Long-term
Providing assistance to obtain green-related certifications	Ministry of Industries (MoI), and Sustainable and Renewable Energy Development Authority (SREDA)	Long-term
Economic incentives		
Providing market-driven incentives, such as tax breaks and subsidies, for factories that invest in sustainable production processes	Ministry of Industries (MoI), Ministry of Finance (MoF), and Ministry of Commerce (MoC)	Short to medium-term
Withdrawing fiscal support to the polluters	Ministry of Industries (MoI), Ministry of Finance (MoF), and Ministry of Power, Energy and Mineral Resources (MoPEMR)	Short to medium-term
Providing premium prices for products from green factories	Ministry of Industries (MoI) and International Buyers	Short to medium-term

(Table A10.1 Contd.)

(Table A10.1 Contd.)

Actions Required	Responsible Ministries/ Agencies	Timeline
Access to green finance		
Creating a comprehensive system for accessing green financing programmes	ICT Division, Ministry of Finance (MoF), Bangladesh Bank (BB), and Ministry of Industries (MoI)	Medium to long-term
Establishing a credit guarantee scheme to enable smaller factories to access sustainable financing options	Commercial Banks, Bangladesh Bank (BB), and Ministry of Industries (MoI)	Medium to long-term
Awareness and knowledge sharing		
Making information on greening publicly available	Ministry of Environment Forest and Climate Change (MoEFCC), Ministry of Industries (MoI), and ICT Division	Medium to long-term
Conducting workshops, training sessions, and campaigns to foster changes in values and attitudes towards sustainability	Ministry of Environment Forest and Climate Change (MoEFCC), Ministry of Industries (MoI), and Ministry of Information and Broadcasting (MoIB)	Short to medium-term
Providing technical guidance and support to mitigate knowledge gaps	Government, International Buyers Associations, International Development Partners, and Academia	Short to medium-term
Skills and capacity development		
Increasing the availability of skilled human resources	National Skills Development Authority (NSDA), Ministry of Industry (MoI), and Industry Association	Short to medium-term
Establishing a green skills development fund	Ministry of Environment, Forest and Climate Change (MoEFCC), Ministry of Industries (MoI), Ministry of Finance (MoF) and Bangladesh Bank (BB)	Medium to long-term

Source: Authors' compilation.

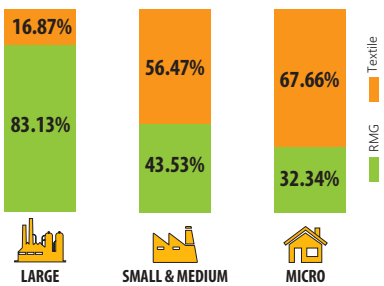
INFOGRAPHIC 1

Securing
Green Transition of the
Textile and Readymade Garments Sector in Bangladesh

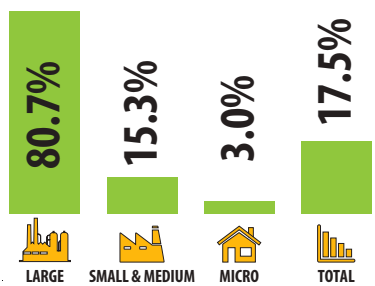
HOW FACTORIES ARE ADOPTING GREEN INITIATIVES A SNAPSHOT

CPD carried out a nationwide survey which covered owners and managers of 403 factories in Bangladesh. Of these, 182 were RMG and 221 were textile factories. Additionally, a total of 4,541 workers and supervisors were interviewed as part of this survey.

SIZE AND TYPE OF SURVEYED FACTORIES



WHETHER FACTORIES KNOW ABOUT GREEN BUILDING CERTIFICATION?



WHAT MOTIVATES FACTORIES TO ATTAIN GREEN BUILDING/PRODUCTION/PROCESS CERTIFICATION

Factories with green building certificate

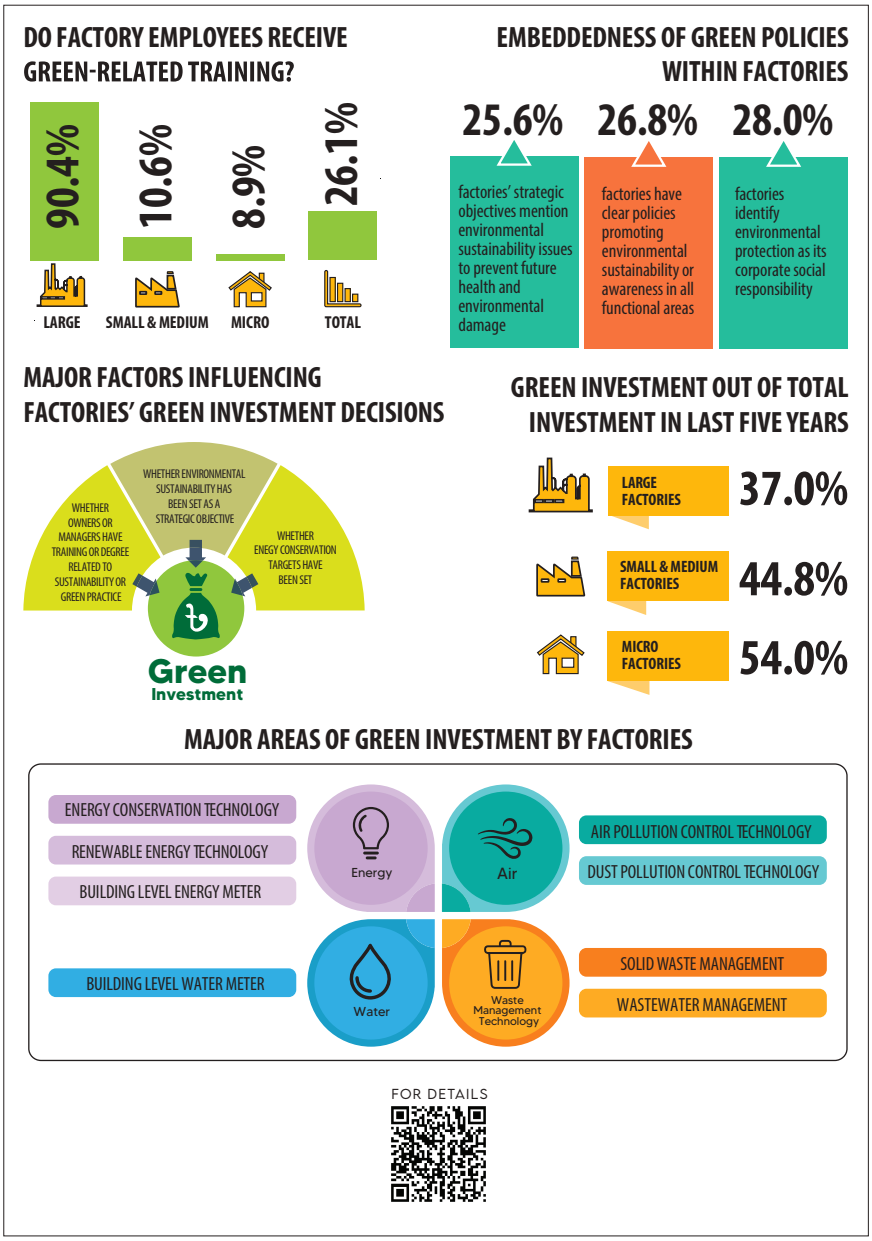
Factories that do not have any green building certificate but want to obtain in the future

Factories with green product/ material/ resources/production process certificate

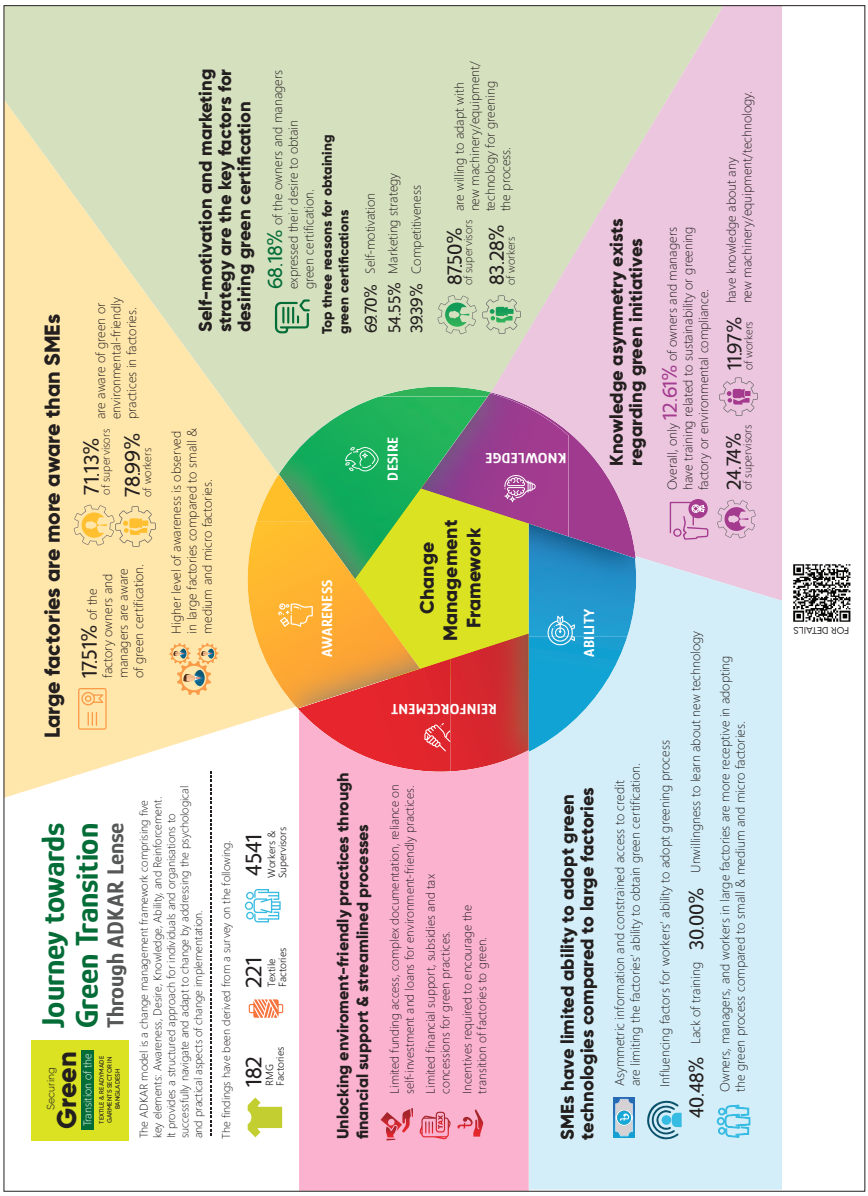
Factories that want to obtain green product/ material/resources/production process certificate in future

(Infographic 1 contd.)

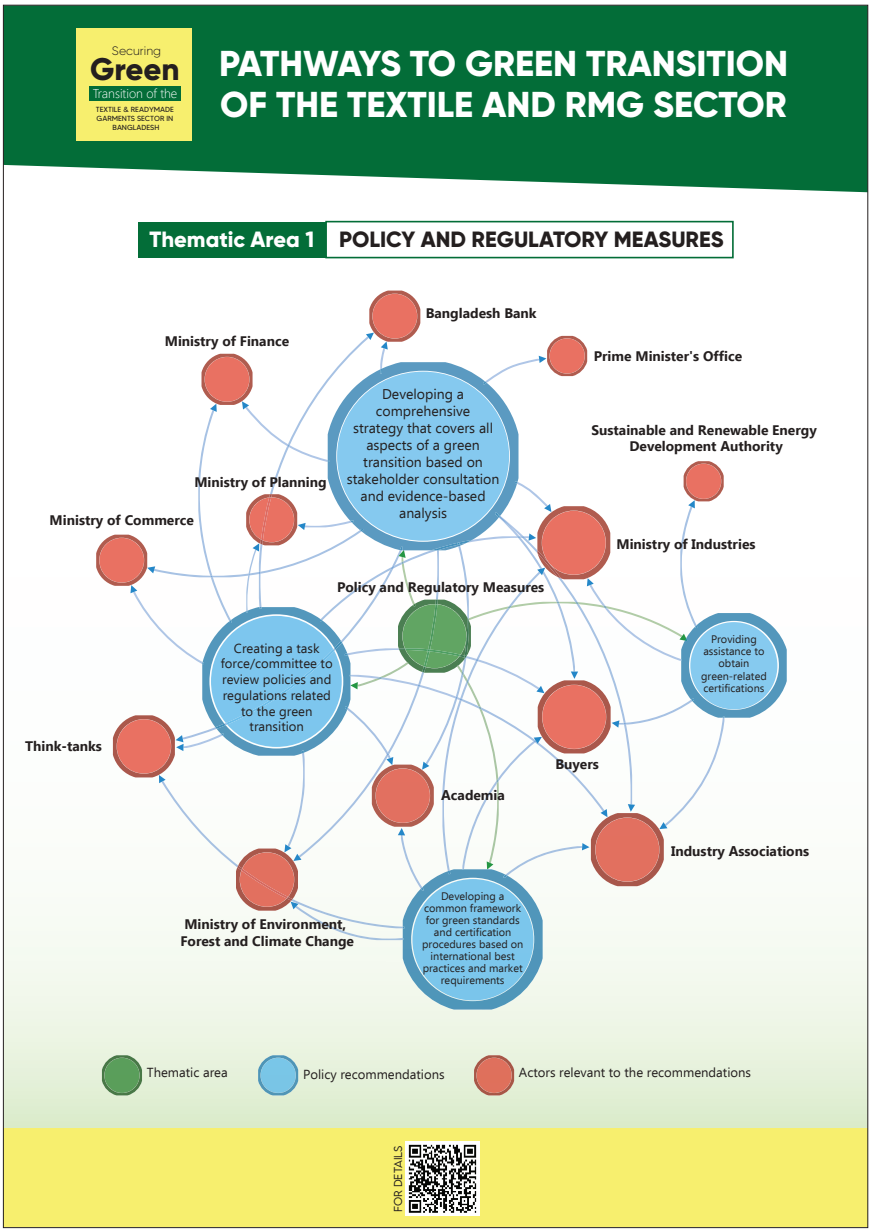
(Infographic 1 contd.)



INFOGRAPHIC 2



INFOGRAPHIC 3



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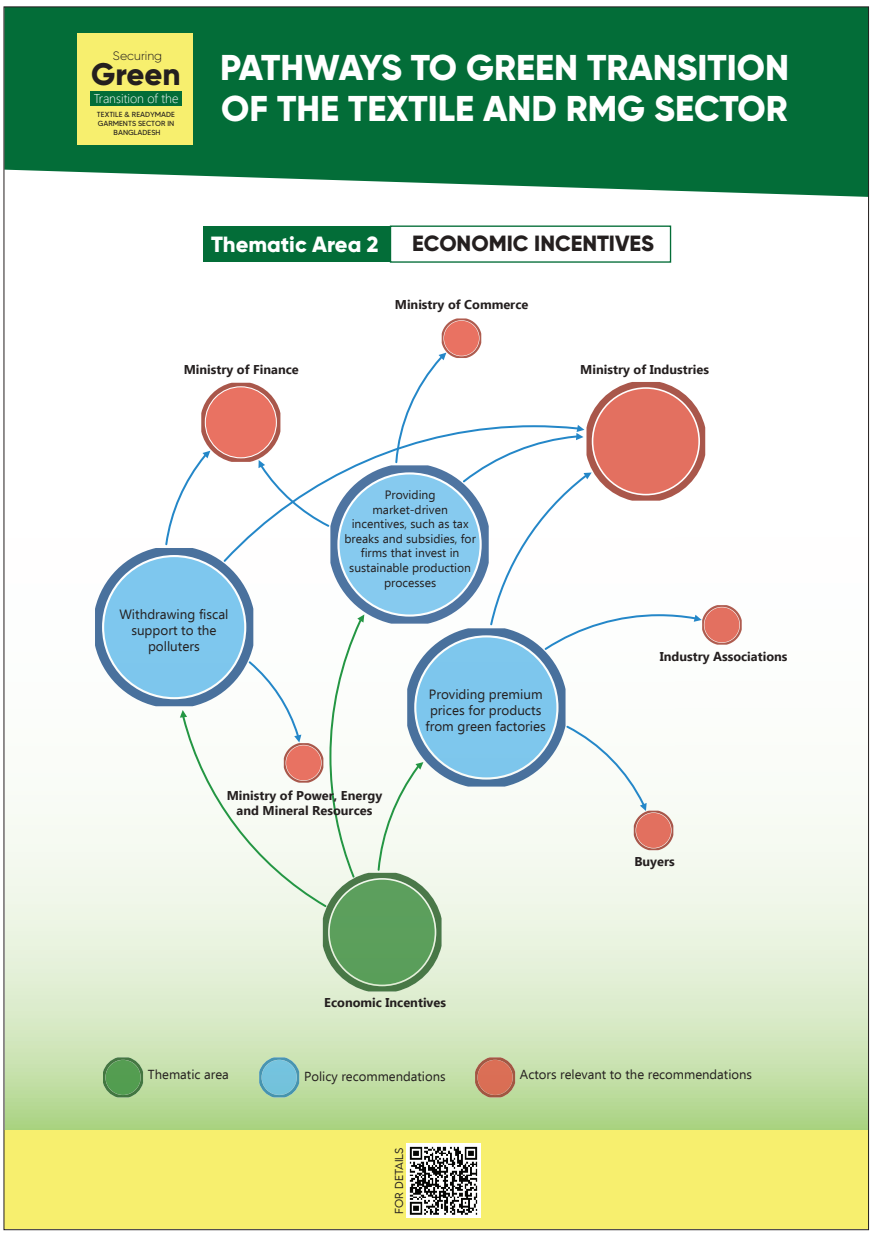

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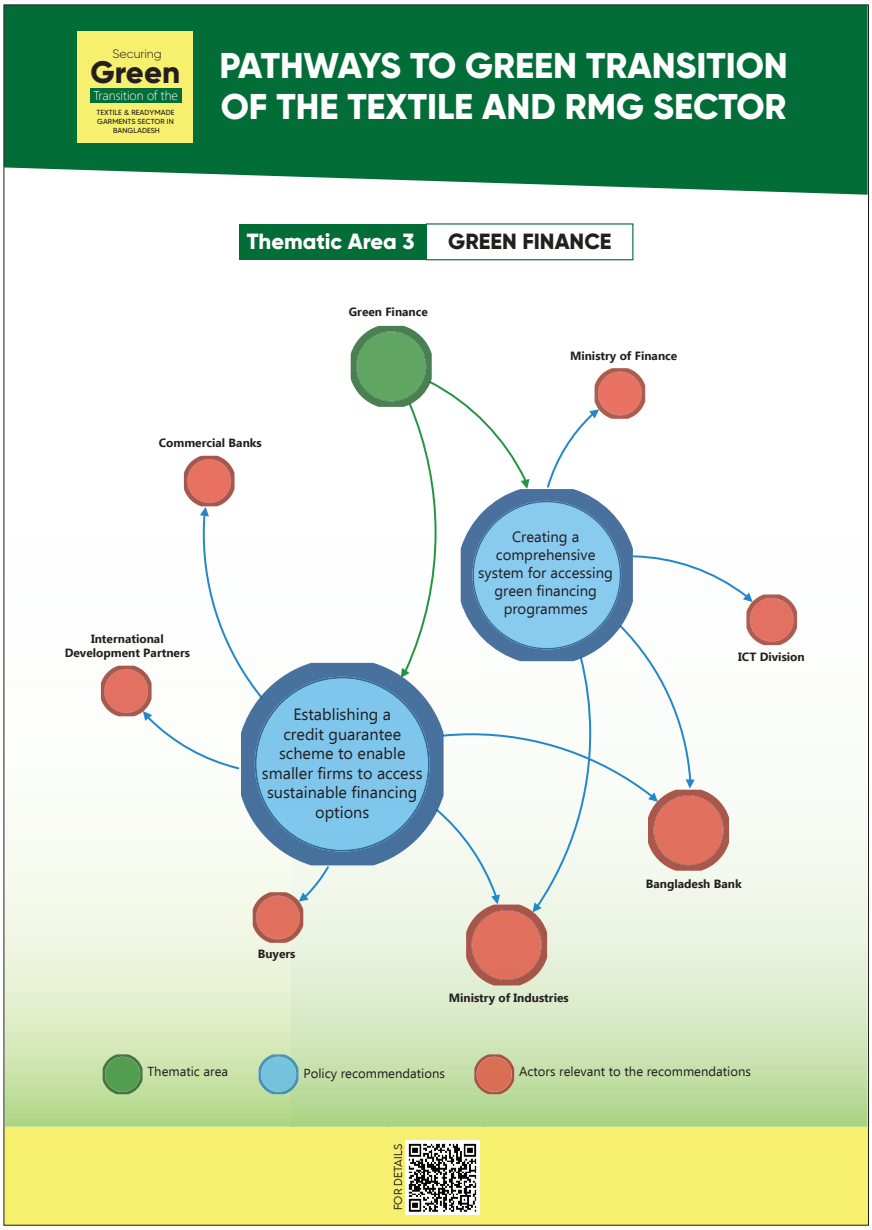
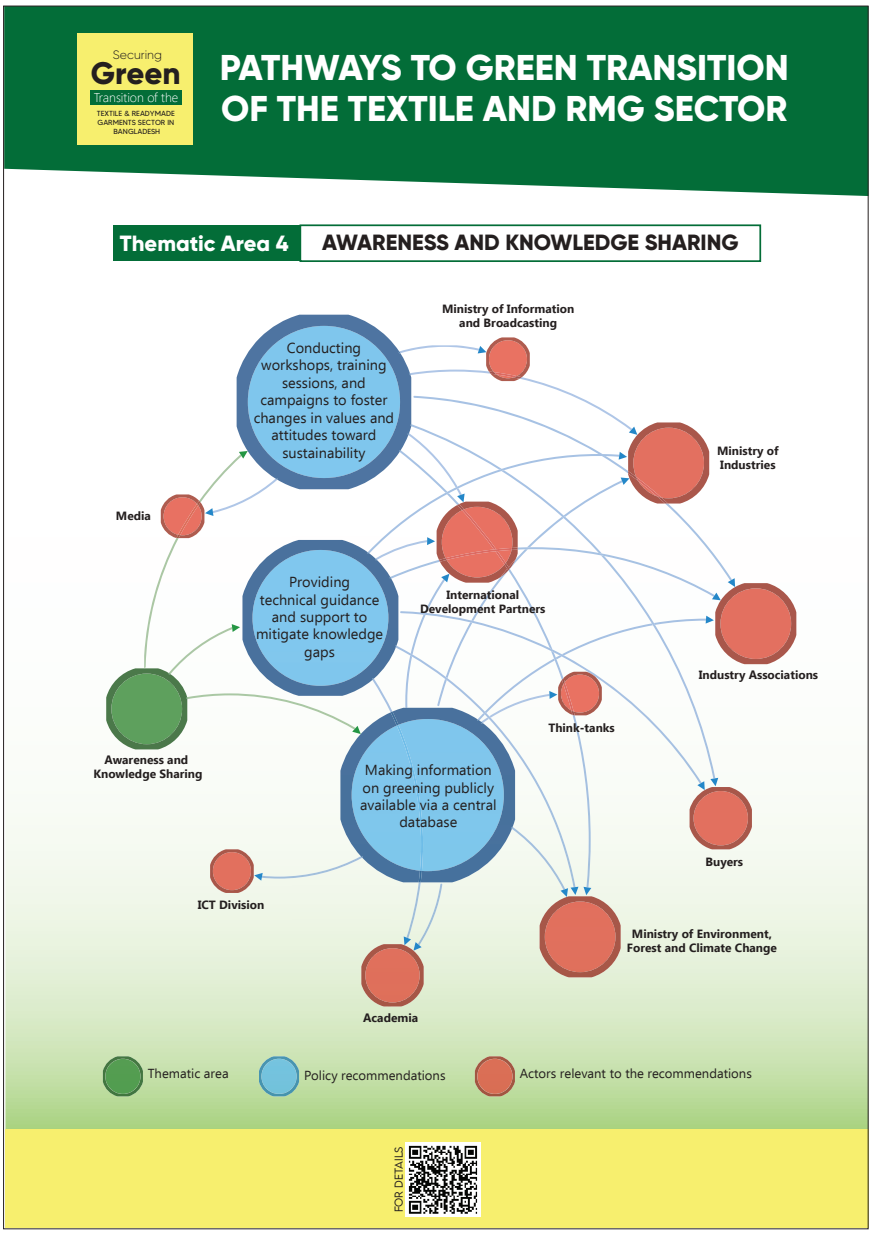


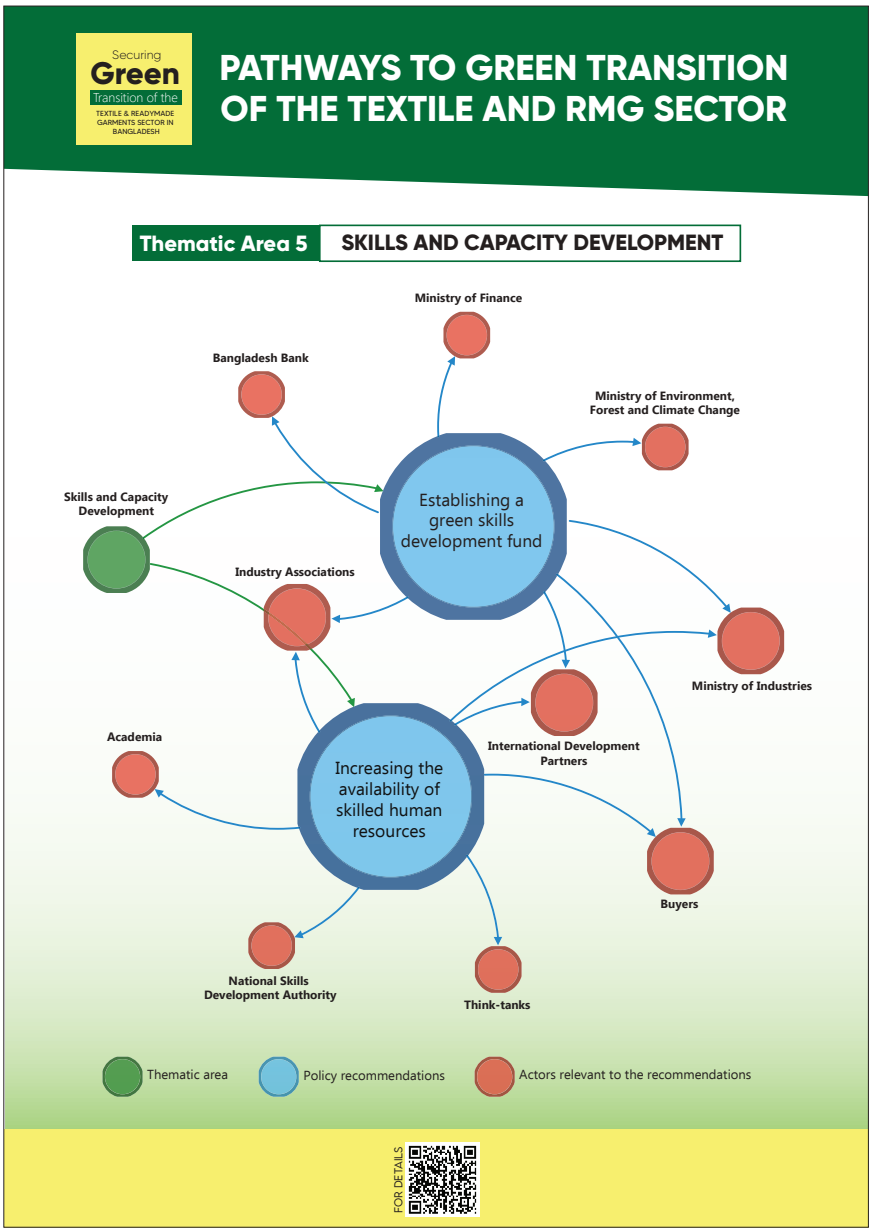
(Infographic 3 contd.)

(Infographic 3 contd.)



(Infographic 3 contd.)

(Infographic 3 contd.)



Navigating the Textile and Readymade Garments Sector Towards Green Transition

The Experience in Bangladesh

The green economic transition is crucial for sustainable growth, especially following the 2015 Paris Climate Agreement, which amplified the global demand for eco-friendly production and consumption. Whilst large corporations in developed countries are making strides towards reducing carbon emissions, companies in least-developed countries, like Bangladesh, lag due to financial and technological constraints. Despite its significant economic growth, Bangladesh faces severe environmental degradation. The country's textile and RMG sector, a key driver of its economy, must now navigate challenges related to environmental compliance and sustainability.