Focus 77 – **Technology Transfer in Bangladesh to Accelerate Energy Transition**[1]

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Abstract

Retail manufacturing is an industry that puts high demand on energy resources. Bangladesh is one of the world's largest garment exporters; its ready-made garment sector (RMG) accounts for 84% its exports. Nevertheless, in 2020, Bangladesh ranked only 87 out of 115 countries in the World Economic Forum's Energy Transition Index. This indicates both a major challenge and a potential for the country and its largest industry. In order to accelerate energy transition, substantial investments into renewable energy sources and technologies, as well as knowledge transfer in the form of training and capacity building, are crucial. Through an analysis of the current state of the energy sector, technology transfer, foreign aid, and government policies, the paper explores the future of technology transfer in Bangladesh and its potential in the garment industry. It discusses a focus shift of aid programmes, foreign direct investment (FDI) in research & development (R&D), as well as policies enabling an investment environment. All of these constitute pathways for a fast energy transition.

Keywords: technology transfer, knowledge transfer, energy transition, renewable energy, Bangladesh ready-made garments, textile industry

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Introduction

Bangladesh's Ready Made Garment Industry

Although employing around 40.6% of the country's labour force (in 2016-17), agriculture contributes only 13.02% to the Gross Domestic Product of Bangladesh. The manufacturing sector contributes about 24.18% (Bangladesh Bureau of Statistics, 2021). The ready-made garment (RMG) industry dominates the manufacturing sector. Bangladesh is the fifth largest garment exporter to the European Union and ranks among the top ten apparel suppliers to the United States (Bangladesh Bureau of Statistics, 2021). It has held second position in textile exports in the past two decades – only behind China – with around 34 billion dollars exports in 2018-19 globally (Berg et al., 2021). However, in the last decade, a series of issues related to safety, working conditions, non-renewable energy use, and lack of energy efficient technologies push the country behind some of its competitors like Vietnam.

Following the Rana Plaza disaster in 2013, wherein a garment factory building collapsed causing massive death and injury among employees, new initiatives on better working conditions and workers' rights and safety were introduced; for instance, the Alliance for Bangladeshi Worker Safety (Tilstra & Beatrice, 2021). This fatal incident, which claimed over a thousand lives, compelled customer countries such as the U.S. to put forth new regulations regarding working conditions in factories and further scrutinise production processes (Tilstra & Beatrice, 2021). Both the government and international development agencies supported the industry as it faced new challenges and needed reforms in energy consumption patterns. While some factories have managed to adopt renewable sources of energy, energy-efficient technologies, and sustainable practices, many were left behind due to lack of know-how, experience, financial support, innovation, and technologies. Given the industry's significance in reducing poverty and moving the country up to a lower-middle income bracket, it is essential to address these challenges.

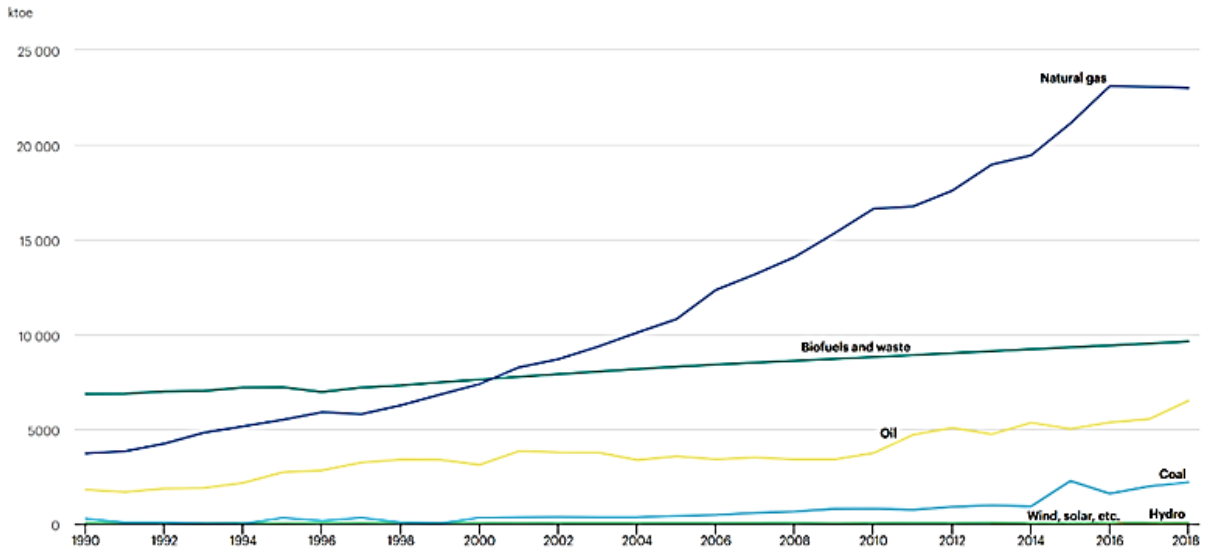
Energy Demand, Production, & Consumption

According to the International Energy Agency, Bangladesh holds deposits of natural gas, with 27 gas fields available for power-generation as well as industrial and other uses (Figure 1). Based on data by the International Renewable Energy

Agency (2020), gas provided 51% of the total primary energy supply in Bangladesh in 2017; 31% originated from renewables, mainly biofuels, waste, and hydro-marine.

Figure 1

Total Energy Supply by source, Bangladesh 1990-2018

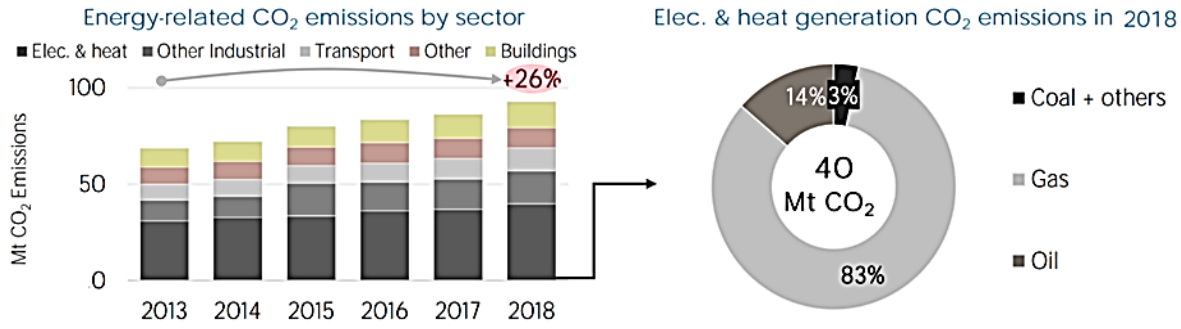


Source: International Energy Agency,(IEA) n.d.

The industrial sector is the largest consumer of electricity in Bangladesh. It is followed by residential, commercial, and public services (IEA, n.d.). However, industrial consumption accounts for only 2% of the total renewable energy used in the country. Over the years, high energy demands forced the government to increase electricity tariffs, resulting in rising costs of production (Khan, 2014; as cited in Hossain, 2020). The highest amount of carbon dioxide emissions originates from the energy sources used for electricity and heat production, as shown in Figure 2. Among those energy sources, natural gas emits 83% of the total CO2 involved (Figure 2).

Figure 2

Energy-related CO2 emissions by sector in Bangladesh & Electricity and heat generation CO2 emissions in Bangladesh in 2018



Source: International Renewable Energy Agency (IRENA), 2020

Energy shortages have also resulted in frequent load shedding and affected the quality of production in factories (Khan, 2014; as cited in Hossain, 2020). According to Petro-Bangla, a rising demand on natural gas will reduce the quantity available to zero by the next 16 years (Hossain, 2020). The country thus looks into other oil markets such as Qatar to import liquefied natural gas for the next 15 years and thereby meet the country's gas demand (bdapparelnews.com, 2018; as cited in Hossain, 2020). Alternative sources of energy can help reduce this economic burden on electricity.

Manufacturing and production processes also consume large quantities of water (Tilstra & Beatrice, 2021). Given the high dependence on fresh water for processes such as washing and dyeing, energy efficiency in water use within the industrial sector is crucial as well. While the international standard for the use of water is 70 litres for washing and dyeing one kg of the fabric, factories in Bangladesh use over 250 litres per kg (Tilstra & Beatrice, 2021). Wet processing unit alone consumes 1,500 billion litres of groundwater per year (Mirdha, 2017; as cited in Hossain, 2020). This, in turn, results in groundwater shortages near factories (Hossain, 2020).

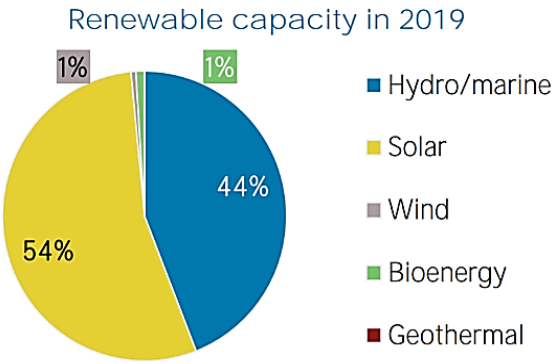
The Potential of Renewable Energy in Bangladesh

Bangladesh is endowed with many potential sources of renewable energy such as solar energy and hydroelectric power. According to the chart shown in Figure 3, out of all the renewable energy sources in the country, solar energy presents the

highest generation capacity (54%), followed by hydro/marine sources (44%). The data on all energy resources currently used (in 2018), including fossil fuels, shows that solar energy provides only 16% of the country's energy generation (IRENA, 2020).

Figure 3

Renewable capacity in 2019, Bangladesh

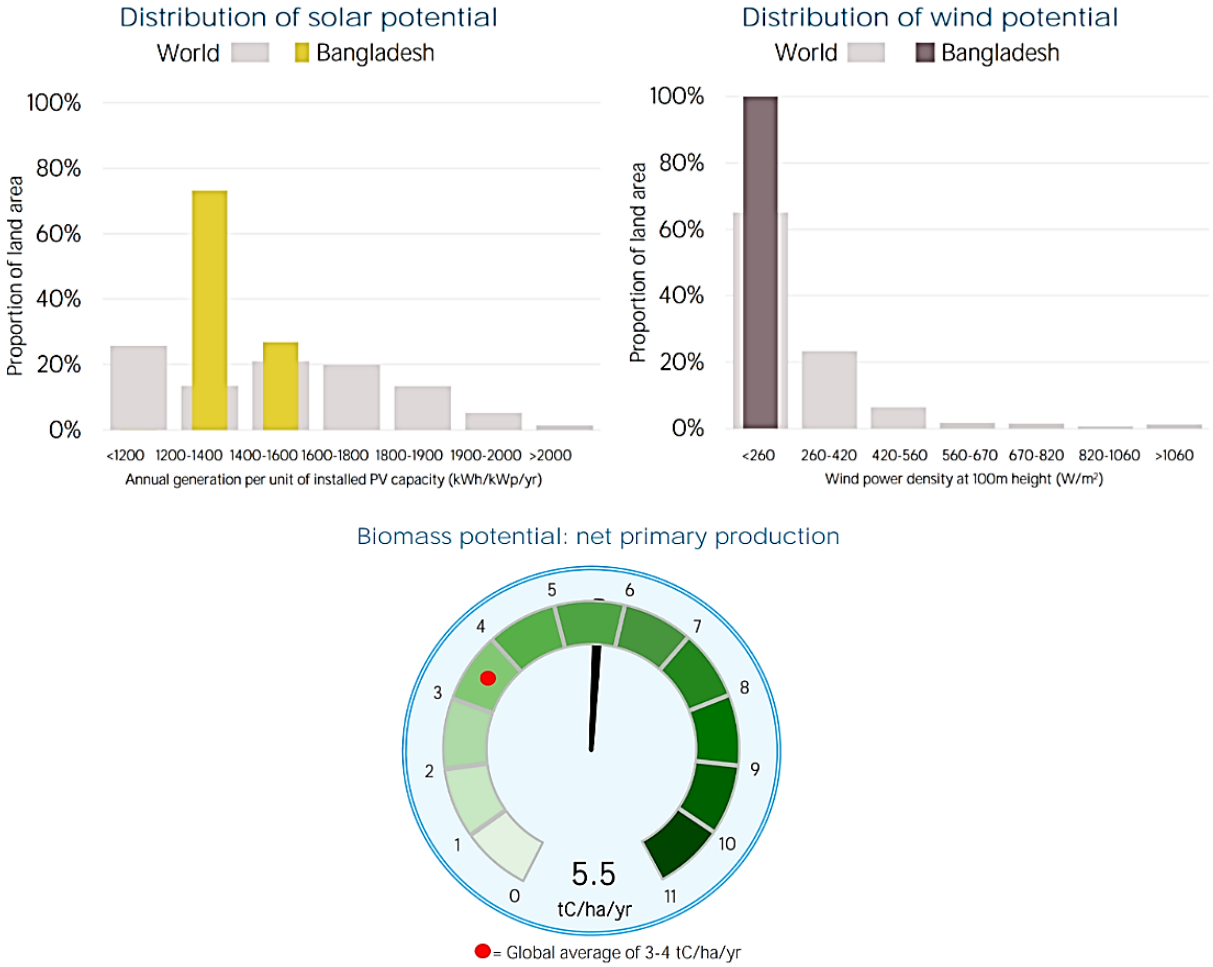


Source: IRENA, 2020

As shown in Figure 4, the country has a solar potential quite above the world average. Wind potential, on the contrary, is below the world average. While the biomass potential is 3-4 tonnes of carbon per hectare per year globally, Bangladesh has the potential of 5.5 tonnes of carbon per hectare per year (IRENA, 2020). According to the Infrastructure Development Company Limited, 1,500 members of the Bangladesh Textile Mills Association together hold 42 million square feet of rooftop space (2019). This could be used to install solar photo voltaic system with a capacity of 400 Mega Watts (Begum, 2019).

Figure 4

Distribution of solar (left), wind (right), biomass (below) potential in Bangladesh, compared to world levels



Source: IRENA, 2020

Government Programmes & Legislation

Over the years, Bangladesh has taken several measures for the garment industry to become safer, greener, and more sustainable. It has become a member of international energy agencies such as IRENA (IRENA, 2009). The government has also formulated numerous policies in the renewable energy sector such as the Sustainable and Renewable Energy Development Authority Act (2012) intended for the effective utilisation and conservation of renewable energy both in the public and private sectors (International Comparative Legal Guides, 2021). Specific policies on solar energy development include the Guideline for Implementation of Solar Power Development Programme (2013) and the Net Metering Guideline (2018), both projects aimed at adding surplus power to the grid (Begum, 2019). In

2015, the Scaling Up Renewable Energy Program and Energy Efficiency and Conservation Master Plan up to 2030 was introduced (International Comparative Legal Guides, 2021).

There are also local and small-scale developments in energy technology. By October 2019, around 62 off-grid roof-top solar projects (with a generation capacity of 14.36 Mega Watts) and 50 on-grid projects (with a generation capacity of 26.45 Mega Watts) have been completed and are run by both public and private sectors (Begum, 2019). The state-owned North-West Power Generation Company Limited has signed a memorandum of understanding with the China National Machinery Import and Export Corporation to develop a renewable energy-based power plant with a 500 Mega Watts capacity, which includes a solar photovoltaic plant, a wind base plant, and others (Begum, 2019).

The Role of Technology Transfer

According to Lindiwe et al. (2007), technology transfer is more than a notion regarding the mere delivery of high-tech equipment from developed to developing countries. It includes, but is not limited to, entire systems and their component parts, 'know-how', goods and services, equipment, and organisational and managerial procedures. It is commonly divided in transfers of hard and soft technologies. Plant, machinery, and equipment constitute hard technologies, whereas soft technology includes training, knowhow, and more efficient means of organising existing production factors. A horizontal technology transfer comprises the long-term sharing of intellectual property, whereas a vertical technology transfer excludes it (Lindiwe et al., 2007).

Often, a hard technology transfer is predominant in developing countries, which often neglect the significance of training, institutional capacity, and infrastructure – all of which are prerequisites for sustaining hard technology (Lindiwe et al., 2007). According to Vaidya & Bennett (2002), one of the routes of technology transfer is through trade and aid intended to strengthen indigenous production for domestic markets. This also demonstrates the importance of management and business models for the overall success of technology transfer. Foreign Direct Investment (FDI) and sub-contracting producers to build export-oriented local companies constitute another way to transfer technology. A third route involves the

supply chain of capital equipment and materials so as to develop local subcontracting capacities (Vaidya & Bennett, 2002).

Bangladesh's Experience in Technology Transfer

Technology and knowledge transfer are not new to Bangladesh. Several international development organisations such as the 'Deutsche Gesellschaft für Internationale Zusammenarbeit' (GIZ), the 'United Nations Development Programme', the 'Foreign Commonwealth and Development Office', the 'Danish International Development Agency', and 'Solidaridad' have offered extensive subsidised development programmes, coaching services or access to services that target energy transition (Tilstra & Beatrice, 2021). Many such programmes are aimed at the domestic sector, for instance the Rural Electrification and Renewable Energy Development projects funded by the World Bank in the period 2003-2018 (World Bank, 2021). While solar home systems are key to energy transition, only a few grants concern the development of renewable energy in the retail manufacturing sector. Some of these are projects funded by the GIZ and commissioned by the German Federal Ministry for Economic Cooperation and Development, the EU, and other international partners (GIZ, n.d.).

The German GIZ has planned and supported several renewable energies and energy efficiency programmes (REEEP) in Bangladesh. One such project, ran from 2007 until 2018, has offered technical support for the installation of about 1,500 biogas plants (GIZ, n.d.). The project also piloted an industrial solar pipe light for free natural lighting in small and medium-sized enterprises. More specific to the RMG industry, the project introduced an LED tube light project in 2015. Different options regarding energy efficiency in composite textile industries are also being explored through energy audits. In order to achieve the project's future goals, the German GIZ aims to leverage finance, develop a monitoring protocol, and train utility personnel (GIZ, n.d.). Many projects still overlook energy management in the garment industry in Bangladesh, and this needs to change in order to ensure a smooth energy transition.

The Future of Technology Transfer for Bangladesh

RMG-Oriented Aid Programmes

A fast energy transition can happen when technology transfer occurs in an economy's most crucial sectors; in the case of Bangladesh, retail manufacturing. While international development organisations have been engaged in the transfer of both hard and soft technologies in the country, the focus has been more on the residential sector instead of the garment industry sector, which consumes substantial amounts of water and electricity. Previous aid programmes have helped achieve the goal of 'electricity for all'. It is now time to consider the significance of the industry's energy usage so as to achieve a renewable energy transition within a shorter period of time. Research on energy consumption and on the types of energy used in industries are necessary for policy recommendations regarding energy transition. For instance, databases of international agencies such as the IRENA lack adequate data on renewable energy potential in many developing countries, including Bangladesh. International aid that focuses on regular assessments of existing energy use, renewable energy potential, and carbon footprints will be useful in recommending policies for a fast energy transition.

Foreign Direct Investment and Research & Development

Bangladesh has the choice of different routes of technology transfer to explore. Technology transfer routes listed by Vaidya & Bennett (2002) include Foreign Direct Investment (FDI) and sub-contracting intended to develop export-oriented firms. Transfer routes involving supply chains of materials so as to develop local capacity in terms of solar power expansion, particularly for the garment sector, can be effective in meeting the industrial demands of electricity and heat. For instance, direct investment can be increased in Research and Development (R&D) of sustainable production processes, on renewable energy technologies in textile enterprises, and in educational institutions such as the Bangladesh University of Textiles, the Renewable Energy Research Centre of the University of Dhaka, and the Rajshahi University of Engineering and Technology. Considering the fact that aid programmes were successful in utilising local resources and strengthening indigenous production for domestic markets, a similar approach in private investment can help develop local products and improve local capacity.

Policies for Innovation and Investment Environment

National policies matter for attracting foreign investments, as well as for future developments in the energy sector. Investments from developed countries have the potential to improve several nations' energy environment through the transfer of cleaner technologies and know-how. According to the World Bank, business registration in Bangladesh takes 19.5 days on average and includes nine distinct steps (United States Department of State, n.d.). The online one-step service for business by the Bangladesh Investment Development Authority has reduced this hassle; however, certain steps still require in-person presence (United States Department of State, n.d.). Establishing a transparent, enabling policy environment helps improving the country's profile and leverage public/private investment projects.

Customer Country Regulations

While the European Union (EU), the United States, and other developed countries can make huge investments in clean technology and other transition strategies, developing countries rely on foreign aid through developmental projects to make energy transition a reality (Tilstra & Beatrice, 2021). Numerous policies aiming at a fast energy transition have been developed by the EU, including imports regulation. For instance, the new carbon border adjustment mechanism puts tax constraints on several importing countries, including Bangladesh (Eicke, et.al., 2021). While trade regulations aiming at carbon neutrality are needed according to industrialised countries, a holistic approach that contemplates the concerns of growing economies and which favours cooperation appears more effective for global energy transition.

Conclusion

Bangladesh is one of the largest textile exporters in the world. Considering the industry's high energy consumption, it is crucial to strengthen the routes of technology and knowledge transfer to the country in order to accelerate energy transition. Although there are international aid programmes and varied government policies directed at renewable energy use, they are mostly limited to the domestic use. Industries, and the ready-made garment (RMG) in particular, now seem an obvious target. Regular assessments should be carried out to analyse the potential

of solar energy. Foreign investments in renewable energy technologies as well as know-how are needed in R&D concerning both local enterprises and universities so as to increase local capacities. Relevant national policies are also crucial to assist investments and technology transfer. Finally, it is important for developed nations to take into consideration the shortcomings of trade partners such as Bangladesh and cooperate to accelerate energy transition globally through both financial and technological support.

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