Macro-economic Outlook for Bangladesh over 2020 and 2035

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Acronym and Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BAU	Business as Usual
BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistics
BDP	Bangladesh Delta Plan
BGMEA	Bangladesh Garments Manufacturers and Exporters Association
BRICS	Brazil, Russian Federation, India, China and South Africa
BUET	Bangladesh University of Engineering and Technology
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
DB	Doing Business Index
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
EU	European Union
FDI	Foreign Direct Investment
FY	Fiscal Year
FYP	Five-Year Plan
GCC	Cooperation Council for the Arab States of the Gulf
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GNI	Gross National Income
GOB	Government of Bangladesh
ICOR	Incremental Capital Output Ratio
IMF	International Monetary Fund
LDC	Least Developing Countries
LLDC	Landlocked Developing Countries
LPI	Logistics Performance Index
MERCOSUR	Southern Common Market (Mercado Común del Sur)
MOF	Ministry of Finance
NBR	National Board of Revenue
O&M	Operations and Maintenance
OECD	Organization for Economic Cooperation and Development
SAARC	South Asian Association for Regional Cooperation
RMG	Readymade Garments
SAARC	South Asian Association for Regional Cooperation
SAM	Social Accounting Matrix
SADC	Southern African Development Community
SIDS	Small Island Developing States
TFP	Total Factor Productivity
TVET	Technical and Vocational Education and Training
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
USA	United States of America
WB	World Bank
WEFM	World Economic Forecasting Model

1. Introduction

Bangladesh, being one of the fastest-growing economies in the world, is ranked 41st in terms of GDP size and is looking forward to graduating to an 'Upper-middle income country' by 2031 and a developed country by 2041. Throughout the past few decades, the nation attained significant improvements in some of the major macroeconomic indicators. The poverty rate was reduced to 20.5 per cent in FY19. The per capita income grew to US$2824 and social safety net programmes expanded their coverages on old-age and mother and child allowances. In 2020, the infant mortality rate reduced notably and currently the life expectancy on average is 72.8 years. The 8th FYP was announced in 2020 following the success of the 7th FYP. However, in early 2020, the Government of Bangladesh was quite optimistic that this upward trend of these indicators will continue to have another great year – with respect to growth and poverty reduction. But the optimism was seriously dented by the severe onslaught of COVID-19. It had virtually stalled all economic activities all over the world.

The COVID-19 outbreak had inflicted dramatic global impacts on trade, production, and other economic activities. It imposed substantial impacts on the Bangladesh economy. During the first wave and the first nationwide lockdown situation, economic growth in Bangladesh was also severely interrupted. Estimates of the World Bank and IMF projected 1.6 per cent and 3.8 per cent GDP growth rates for 2020. Bangladesh was exposed as it relies on a narrow economic base (comprising garments/textile, agriculture, construction, and foreign remittance earnings) and is a moderately open economy (exports and imports together account for around 30% of GDP). There was a decline in demands in both the local markets and in the export markets as there was an increase in layoffs of jobs while the overall income declined. On the supply side, like many countries in the World, Bangladesh is highly reliant on China for raw material inputs for its economic activities including garment and textiles. Furthermore, capital inflows from China are key to various sectors, particularly in the construction sector. Also, Bangladesh's higher value-added exports are concentrated on the countries in Europe and the USA, which were one of the biggest epicentres of the pandemic during that time.

Right after the first hit of the pandemic, the economy slowly started to recover and achieved a nominal GDP of over BDT 35 million during the fiscal year 2020-21. Despite the economic impacts of the pandemic, the real GDP growth for FY2020-21 reached 6.94%. The inflation rate was 5.56% during that time. Only 0.13% of the gross investments made in the economy accounted for Foreign Direct Investment (FDI), which was lower than the previous year. The net exports of goods and services made that year were at -6.40%. On the supply side, the manufacturing and service sectors bounced back with the help of the government's fiscal and monetary stimulus packages. On the demand side, the export markets and consumption picked up to stimulate growth in the economy. The remittance inflows experienced major fluctuations during this period as many of the migrant workers were not able to return to their jobs abroad.

However, the exchange rate increased to 84.81 in FY2020-21, and it keeps hiking up each day till today, which is a nationwide concern right now in the economy of Bangladesh. However, this inflationary pressure and a current account deficit are now further triggered by the ongoing Russia-Ukraine conflict. Even though the Bangladesh economy was making strong progress in the recovery phase of the pandemic, this new conflict already reversed it back in certain cases. As global prices are on the rise, especially for food and energy, it is generating severe inflation in the national economy which is

likely to increase the poverty rate again. This ongoing dispute is inducing some critical challenges in Bangladesh as a whole. Therefore, Bangladesh needs to take up some adequate strategies to recover from this new turmoil.

Moreover, we need to recognize at the outset, that a set of pre-existing socio-economic vulnerabilities in the Bangladesh context, would exacerbate the welfare and distributional impacts of the gathering crisis. These include clustering around the poverty line and the potential for large increases in the poverty headcount; high levels of household indebtedness; and weak channels of social protection.

The prime objective of this exercise is to project macroeconomic outlooks over the 2020 to 2035 period. It aims to project outlooks for the following key indicators:

- GDP and its growth
- Investment and I/Y ratio and including a breakdown of investment for the education and TVET sector
- Employment and unemployment

The paper used a simple macroeconomic framework that consists of five accounts: (i) real side; (ii) fiscal; (iii) money and credit; (iv) balance of payment; and (v) poverty and distribution. In addition to these blocks, a debt block is appended to capture debt dynamics.

2. Growth Impacts of COVID-19 and Recovery Scenarios

Growth impacts of COVID-19 have been compared against the pre-COVID-19 (or No COVID-19) scenario. The performances of Bangladesh's economy were impressive before the onslaught of COVID-19. For comparison purposes, impacts on economic growth and speed of recovery to the Perspective Plan growth paths projected by the World Bank (WB), Asian Development Bank (ADB), International Monetary Funds (IMF) and Bangladesh Government (Ministry of Finance and 8th FYP) are provided here.

2.1 No COVID-19 Scenario (FY 2020-21)

The No COVID-19 scenario is based on the revised 8FYP Macro-economic framework. Noting that this is before the adjustments for the provisional COVID impacts. The GDP, employment and poverty outcomes under the NO COVID-19 scenario are presented below.

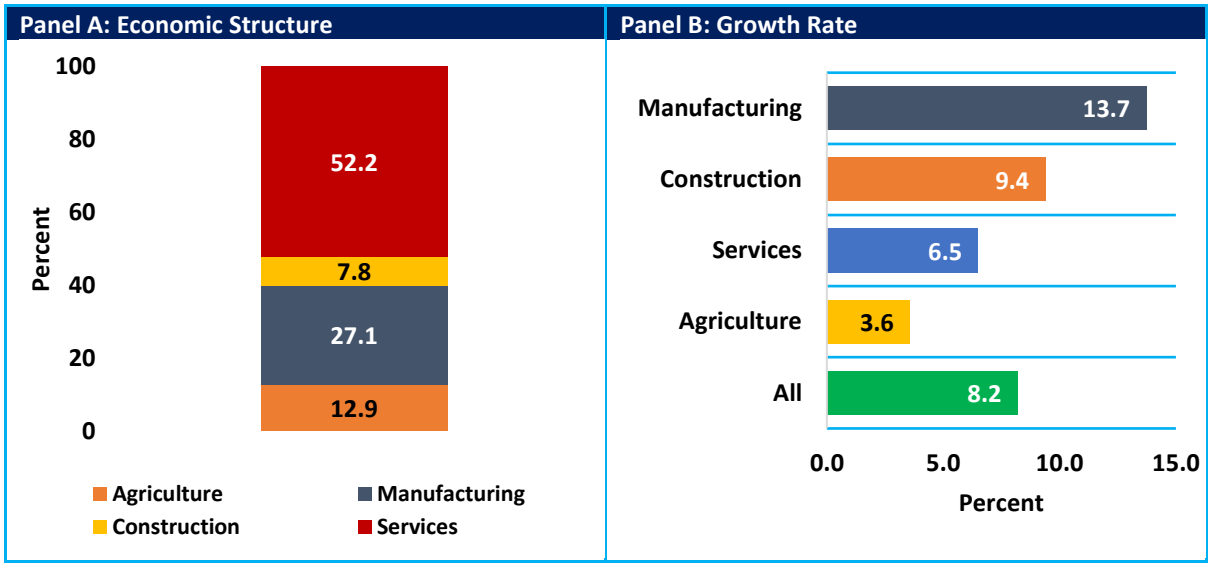
Figure 1. GDP, Employment and Poverty under BAU scenario

Source: 8FYP; SAM 2020; ESAM and Poverty Model

Key observations:

- *The size of Bangladesh's economy has been estimated at $ 416.3 billion at current prices and $ 334.2 billion at constant prices.*
- *GDP growth without any demand shock is projected to achieve 7.25 per cent in FY 2021-22.*
- *The total number of employed persons are 64.0 million implying a low unemployment rate of 3.7 per cent.*
- *The Head count poverty rate drops further to 20.5 per cent of the total population (i.e. 169.1 million) from the head count poverty rate of 24.3 per cent in 2016. The number of poor people is still 34.7 million.*

Figure 2. Structure and Growth Rates under NO COVID-19 scenario



Despite efforts to push industry-led economic expansion, Bangladesh's economy is still dominated by the services sector accounting for more than 52 per cent of GDP. It is composed of formal services and large numbers of informal services. The share of Manufacturing has estimated to be 27.1 per cent. The contribution of the construction sector is 7.8 per cent. The agriculture sector is expected to account for 12.7 per cent.

Manufacturing GDP has been estimated to be around 14 per cent –largely depending on the performance of the RMG/Textile sector. Ongoing mega projects are expected to result in 9.4 per cent growth in the construction sector. Growth rates for the Services and Agriculture sectors are respectively 6.5 per cent and 3.6 per cent.

BAU scenario provides the benchmark data against which the GDP, employment, household consumption and poverty outcomes under the demand shock as well as stimulus scenarios are compared.

2.2 COVID-19 Shock Scenarios

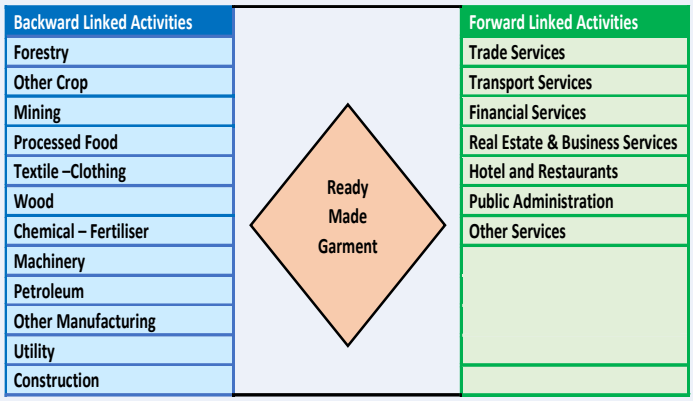
A number of estimates or simulations are available on the impact of COVID-19 shocks. Crucially, the crisis operates through both demand and supply channels. Bangladesh is exposed as it relies on a narrow economic base (comprising garment/textile, agriculture, construction and foreign remittance earnings) and is a moderately open economy (exports and imports together account for around 30% of GDP). On the supply side, like many countries in the World, Bangladesh is highly reliant on China for raw material inputs for its economic activities including garment and textiles. Capital inflows from

China are key to various sectors, particularly in the construction sector. Furthermore, Bangladesh's higher value-added exports are concentrated on the countries in Europe and the USA, the new epicentres of the virus outbreak. The underlying size and trends of some of the key important demand drivers as well as supply-side shocks are provided below:

- **Duration of the global outbreak impacts** (base month is March): optimistic – 4 months (Mar – June) with China exits crisis, quick peak in EU and US. Less optimistic – 6 months (Mar - Aug) with EU & USA peak in May, very slow opening up in EU/USA).
- **Export loss of Garment/Textile sector:** optimistic – reduction of 10% in RMG export demand (Bangladesh Bank and MOF) and less optimistic – reduction of 30% in export demand (8FYP macro-frame before and after COVID 19 & BGMEA president's assessment on buyers' order, 55 % capacity utilization etc.).
- **Foreign Remittance:** optimistic – 3.7% Reduction (8FYP macro-frame before and after COVID 19) and less optimistic – 18% Reduction (average of WB 22% and IMF's 17% reduction).
- **Agriculture:** optimistic – 3+ growth (due to mainly to good Boro harvest) and less optimistic – around 1% (since fisheries and livestock are income elastic – prolonged and large income losses likely to reduce demand).
- **Lockdown:** optimistic – 4 weeks (underutilization of installed capacity) and less optimistic – 8 weeks (underutilization of installed capacity).

Box 1: RMG and Remittance – key growth drivers in Bangladesh

RMG is a growth puller in Bangladesh with its vast and strong linkages with the rest of the economic activities. According to SAM multiplier analysis, it is found that out of 23 commodities, it requires inputs from as many as 18 commodities. The numbers of backward and forward linked sectors are respectively 11 and 7. Contraction of RMG activity would thus also contract outputs of these 23 linked sectors. RMG activity has been found one of the most integrated activities in Bangladesh and thus negative impact on the RMG activity would likely have a deleterious effect on the economy by reducing output, factor demand and factor income (or what is also known as the primary income generation) and household income and consumption expenditure.



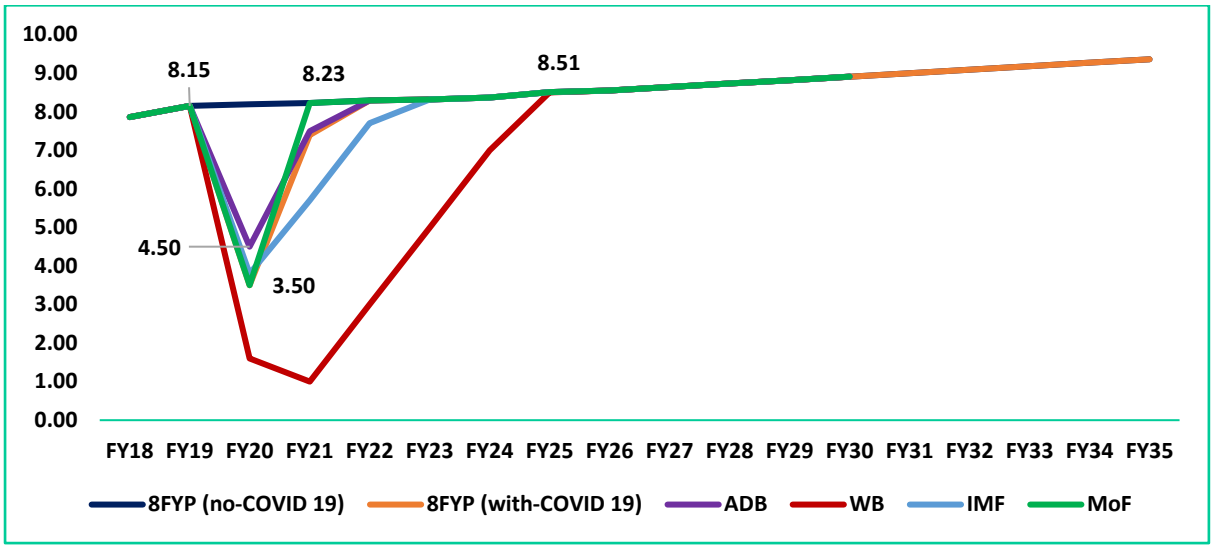
Source: SAM 2020

Similarly, salutary impacts of remittance are well documented. Remittances help stabilize a household's income – leading to higher consumption, nutritional improvement, education payment and increased domestic demand. Thus, a reduction in remittance inflow is likely to have negative impacts on household consumption, household poverty and gross domestic production.

The estimated or simulated impacts on GDP growth rates by various agencies and GOB are collated to provide a comparative assessment of GDP growth rates in 2020 and possible trends in recovery. Understanding these impacts and trends is important to projecting a macro-economic outlook over the 2020 and 2035 periods. We have included the estimates of the Planning Commission (8FYP); the Ministry of Finance (MOF); the World Bank (WB); and the International Monetary Fund (IMF).

Estimates of the World Bank and IMF projected 1.6 per cent and 3.8 per cent GDP growth rates for 2020. The projections for 2021 by WB and IMF were respectively 1 per cent and 5.7 per cent. Asian Development Bank (ADB) on the other projected an optimistic GDP growth rate of 7.5 per cent for 2021 considering a number of conditions.

Figure 3. COVID-19 Impacts on GDP growth rate and recovery paths



Note: ADB, WB and IMF provided GDP growth projections only for 2020 and 2021. The growth rates for other years are authors' projections.

Clearly, GOB (i.e. both Planning Commission and MOF) is expected a sharp V-shaped recovery while WB and IMF expect an elongated V-shaped recovery. However, the recovery may very well be lengthened V-shaped recovery or U shaped (Please see Annex 1 on different types of recoveries).

3. Impacts of the Russia-Ukraine War on Bangladesh Macro-economy

The Russian invasion of Ukraine occurred while the world was only beginning to recover from the effects of the COVID-19 pandemic, which lasted for more than two years. However, as countries have started to expand their economic activities, there is inflationary pressure on the recovery as a result of supply constraints and higher demand. The escalating conflict has shocked the world once more as financial sanctions and supply interruptions present significant economic hurdles. The global economic ramifications will be even more severe if there is no hint of reconciliation between Russia and Ukraine.

3.1 Inflationary Pressure

Russia is the world's third-largest oil producer. It supplies oil and gas throughout the world. Due to the war, the chain impact of rising global oil prices is felt through an increase in the cost of gas, fertilizer, and other necessities. Consequently, the Government of Bangladesh (GoB) increased the price of diesel by around 23% in November 2021, and this has already been reflected in the market by high transportation costs and prices for other necessities (Khatun, 2022). Apart from the oil price hike, the cost of other imported products has also gone up which, in turn, pushes the production costs high and thereby higher prices for consumers. Thus it puts extra pressure on inflation in the short run and it may long last as there is no indicator of the war halting anytime soon.

3.2 Impact on Export

Europe is one of Bangladesh's principal export markets. The European Union region is the destination of 58% of Bangladesh's total exports. In contrast, Bangladesh's overall export revenue from Russia for the FY2019-20 is 1.72%. More than 91% of Bangladesh's exports to Russia were RMG items. Bangladesh's exports to Russia have grown gradually over the last decade. The overall exports to Russia were more than $133 million in the FY2011-12, and it is more than $665 in FY2020-21. On the other hand, Bangladesh's exports to Ukraine in FY2020-21 were more than $26 million. Of the exports to Ukraine, around 25% were vegetables, around 44% were RMG items, and more than 21% were footwear products. Less than 2% of Bangladesh's overall export revenue comes from the countries of Russia and Ukraine combined. Nonetheless, Bangladesh can lose these export revenues if the war between Russia and Ukraine persists. However, the largest issue, though, would arise if Russia continues its invasion of Ukraine and if NATO and European nations also start fighting directly with Russia to defend Ukraine. The battle between Russia and Ukraine might then spread to Europe. Bangladesh will be directly impacted by the war no matter how long it lasts because 58% of Bangladesh's entire export revenue comes from EU member states (Hossan, 2022).

3.3 Import on Import

The Export Promotion Bureau reports that in FY2020-21, Bangladesh imported a variety of items from Russia totalling $466.7 million. Russia is the largest source of imports for Bangladesh, including wheat, cooking oil, fertilizers, chemicals, steel, and aluminium. 29% of the world's wheat, 19% of its corn, and 80% of its sunflower oil are exported by Russia and Ukraine. Due to the difficulty of importing these necessities due to the war, their prices have gone up on the global market and consequently on Bangladesh's economy. Wheat and corn are imported by Bangladesh from Russia. Bangladesh will need to import these commodities from elsewhere due to sanctions.

In the case of fuel, the price of crude oil on the worldwide market during the pandemic, which was just $50 a barrel, has now increased to $139 in 2022. In addition, economists and energy experts anticipate a $200 price increase. Bangladesh will be affected if the price of fuel oil on the international market keeps increasing at this rate because 40% of Bangladesh's entire energy needs must be imported. Oil will, therefore, cost more per litre if it is imported at higher prices. If oil prices increase once more, the cost of transportation and energy would rise as well, severely harming the national economy.

Further, fertilizer use is crucial to Bangladeshi agriculture, especially rice production. Bangladesh imports about 1.2 million tons of fertilizer yearly, including 31% of its demands for nitrogen, 57% for phosphate, and 95% for potash. Average application rates are above 286 kg/hectare. Russia and

Belarus are important worldwide fertilizer exporters, and the war has impacted these markets as well, with export penalties aimed at Russia. Nearly 75% of Bangladesh's potash demands are met by imports from Belarus (34% of total) and Russia (41%). Bangladesh will probably need to purchase these materials from other nations, which will cost more. Reduced input use, particularly the use of nitrogen-based fertilizers, may result in decreased rice production and an increase in the need for rice imports.

3.4 Impact on FDI Inflow

The Russia-Ukraine war will have both direct and indirect impacts on FDI inflow in Bangladesh. The direct impact will be a lower FDI inflow to Bangladesh from Russia. Russia is also carrying out a number of initiatives in Bangladesh, such as the big project called the Rooppur Nuclear Power Plant (RNPP), which will cost USD 12.65 billion and is expected to be done by 2025. This pricey project could be delayed by the ongoing conflict and the economic sanctions imposed on Russia could increase costs for Bangladesh. This suggests increased debt and strain on the nation. On the other hand, the conflict would have made greater uncertainty in the near future, which might have deterred other FDI-source nations from investing in Bangladesh.

3.5 Direct Impact on Government Policies

Bangladesh will need to purchase commodities at greater prices to sustain supplies; this will put a strain on cash reserves and have an effect on the currency market; there have already been signals of currency depreciation. This would then result in an additional price increase for consumers as high world market prices are amplified by a weaker exchange rate. Additionally, public finances would be put under more strain as a result of being forced to choose between paying off the nation's foreign debt, which will cost $460 per person in 2021, and the rising cost of domestic programs.

4. Macro-Economic Framework (2020 to 2035)

4.1 Methodology, Data and the Proposed Analytical Framework

The analytical framework used in this report is *an extension of the analytical framework adopted for the Bangladesh Delta Plan*. In the BDP2100 framework, there was an attempt to quantify the economic impacts of climate change by linking the real side (i.e. economic variables) to the environment or climate change parameters and estimate their implications for GDP growth, employment and poverty reduction. The Delta plan framework provides estimation till 2040. This has been updated with the latest data and parameters to provide estimation till 2030. The analytical framework is composed of four linked models: (i) a macroeconomic model; (ii) an employment satellite module; (iii) a poverty module; and (iv) an environment module. Data sets for the framework have been obtained from several sources such as:

- Bangladesh Bureau of Statistics (BBS)
- Ministry of Finance
- Ministry of Planning
- Ministry of Water Resources
- Delta Plan Project Background Documents
- Bangladesh University of Engineering and Technology (BUET)
- Technical research providing quantitative estimates of the impact of climate change and natural disasters on economic outcomes.

Key features of the framework are discussed below.

List of Key Endogenous Variables and Targets:

- Economic Growth
  - Upper middle income by FY30
- Employment
  - Create new employment in the formal manufacturing and services sectors and away from agriculture and informal services.
- Poverty rate
  - Eliminate extreme poverty by FY30

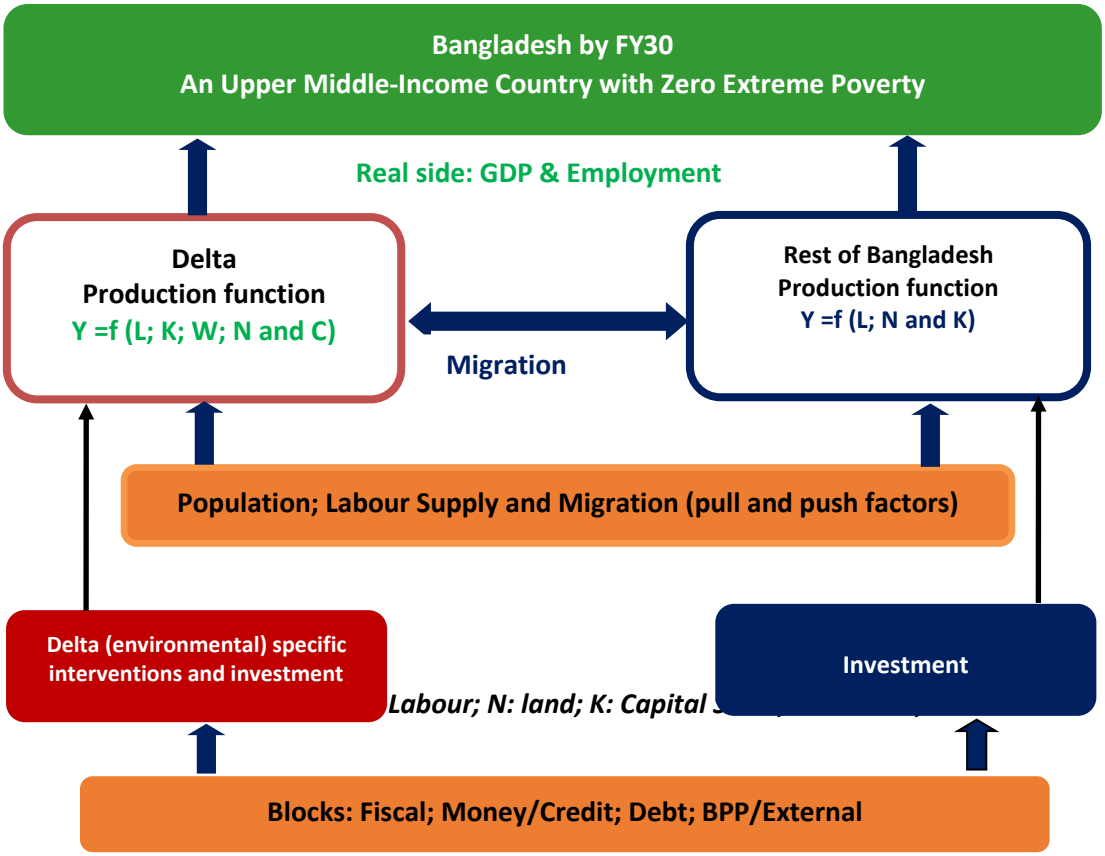
List of key Exogenous Variables:

- Climate change
- Trans-boundary water resources

List of Policy Variables

- Population and labour supply
- Labour for participation with special attention to female labour force participation
- Overall investment (Public; Private; and FDI)
- Total factor productivity improvement focusing on average schooling of 11 years, quality education, skill development and investment in education around 4.5 per cent of GDP by 2030 from the current level of around 2 per cent of GDP.
- Specific investment for mitigating climate change and arresting (improving) deteriorating water and other natural resources.

Figure 4. Analytical Framework

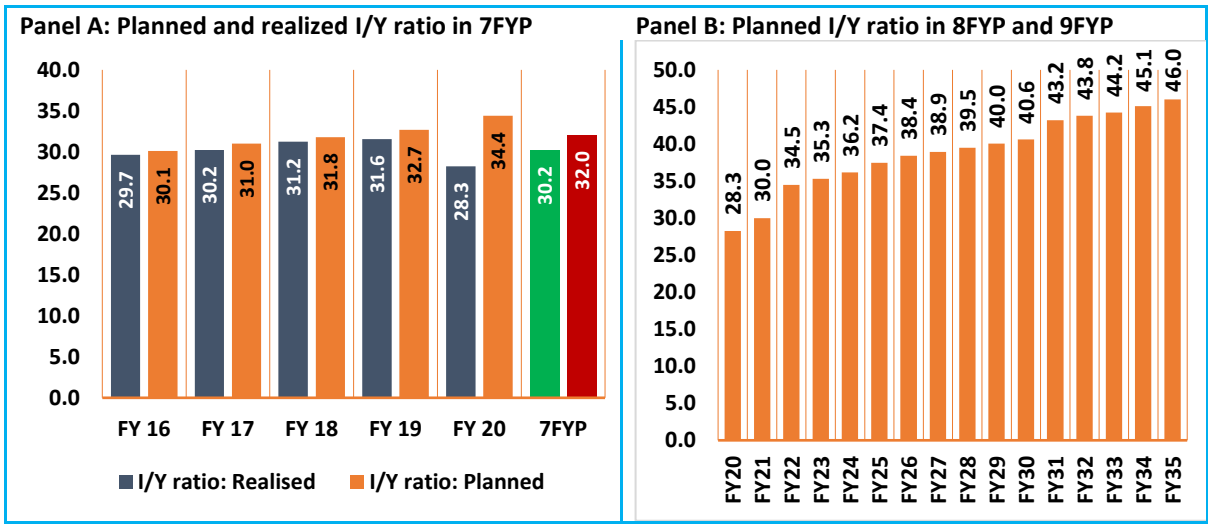


4.2 Key Growth Drivers and Assumptions

Driver 1: Investment and Capital Accumulation

An important driver to propel the planned growth to achieve high economic growth is capital accumulation. A cross-country analysis of the relationship between capital accumulation and economic growth suggests a positive association. Following that the key growth driver in Bangladesh is still the accumulation of capital. Accordingly, to achieve the goal of reaching around 9 per cent growth (high policy scenario), Bangladesh requires to increase its investment to a minimum of 40.6 per cent of GDP in 2030[1] from nearly 28.3 per cent of GDP in 2020. The lion's share of investment would be generated from the private sector but it would only be possible if planned public investment can create an environment favourable for private investment and foreign direct investment. A positive relationship can be observed between investment and GDP growth rate considering cross-country experience. The positive relationship explains that for economies around the world higher investment leads to higher growth of GDP.

Figure 5. Realized and Planned Investment (% of GDP)



The two most important determinants for private sector investment are the cost of production and the incentive structure. Bangladesh's cost structure relative to comparators is high which lowers competitiveness, as reflected by global indicators. It would be extremely difficult to attract much-needed private investment given the relatively high-cost structure.

Table 1. Cost competitiveness indicators, selective countries

Cost competitiveness indicators	Bangladesh	China	India	Sri Lanka	Vietnam
Global competitiveness Index (GCI) 2017 (138 countries)	**106**	**28**	**59**	**71**	**60**
Doing business index (DB) 2017 (190 countries)	**176**	**78**	**130**	**110**	**82**
Trade logistics index (LPI)2016 (160 countries)	**87**	**27**	**35**	**NA**	**64**
Infrastructure quality rankings, 2016 (140 countries)	**111**	**28**	**35**	**93**	**60**
Knowledge economy rankings, 2012 (146 countries)	**137**	**84**	**110**	**101**	**104**

[1] ESCAP (2017), estimated Bangladesh would need to investment $ 10 billion only to cover the huge infrastructure gap between 2015 and 2030. This investment would, however, increase GDP by about 3.94 percentage points implying annual addition to GDP growth of 0.26 percent only from this source. This scenario also includes USD 33 billion investment for Delta projects.

At the same time, the government must also develop the financial market by focusing on three segments: (i) the money market; (ii) the insurance market; and (iii) the bond market. The money market has been performing well till 2009 according to the movements of most of the indicators. Thereafter the performance has been sliding due to a rise in non-performing loans; and continuous eroding of the capital base of the state-owned banks. The insurance market is not fully developed yet and hence it could cover only a small proportion of the clientele. The bond market is not in existence in Bangladesh. Experiences of other countries suggest that all these three segments of the financial market would mobilize funds for economic growth and development. Thus, Bangladesh must develop and as well as strengthen these markets and thereby reducing the reliance of only on the money market for developmental financing.

Delta Fund and Projects: An important component of the overall investment is sufficient allocations for Delta funds such that projects identified in the BDP 2100 Delta projects can be implemented. In September 2018 the Bangladesh Government adopted the Bangladesh Delta Plan 2100 (BDP2100). As a part of this adoption, the Government also endorsed the idea of establishing a Delta Fund. The main logic of the Delta Fund is to ensure that the Delta programme is adequately funded. The BDP2100 argued that presently the government spends about 0.8% of GDP on Delta management, which is inadequate relative to the targets and goals of the Delta Plan. The BDP2100 established a target of securing at least 2.5% of GDP per year to implement the Delta Plan by 2030. Of this, some 2% of GDP would be for new investments and 0.5% of GDP is for operations and maintenance (O&M).

Given the large financing gap, an important policy question is what are the feasible policy options for expanding the Delta Fund resources on an annual cycle during the forthcoming 8th Five Year Plan (8th FYP)? The BDP2100 advocated the following financing plan. The BDP2100 envisaged a build-up of Delta funding by an additional 1.7% of GDP over the base year spending of 0.8% of GDP in FY2017. Of this, 1.2% of GDP would be for investment programmes and 0.5% of GDP for O&M (Table 2.).

Table 2. Sources of Public Sector Financing for the BDP 2100 Investment Program

Components	FY2019	FY2020	FY2025	FY2031
	(As % of GDP)			
A. Total BDP 2100-related spending through budget (B+C+D)	1.2	1.5	2.0	2.0
B. Current level of investment in Delta Plan type projects—Baseline	0.8	0.8	0.8	0.8
C. Recurrent budget (Domestic Resource Mobilization)	0.1	0.2	0.5	0.5
D. New BDP 2100 IP-related spending (E+F)	0.2	0.4	0.7	0.7
E. Foreign Financed (Including Climate Fund) (a+b)	0.2	0.3	0.5	0.5
a. Grant	0.05	0.1	0.1	0.1
b. External sources including Climate Fund	0.10	0.2	0.4	0.4
F. Domestic borrowing	0	0.1	0.2	0.2

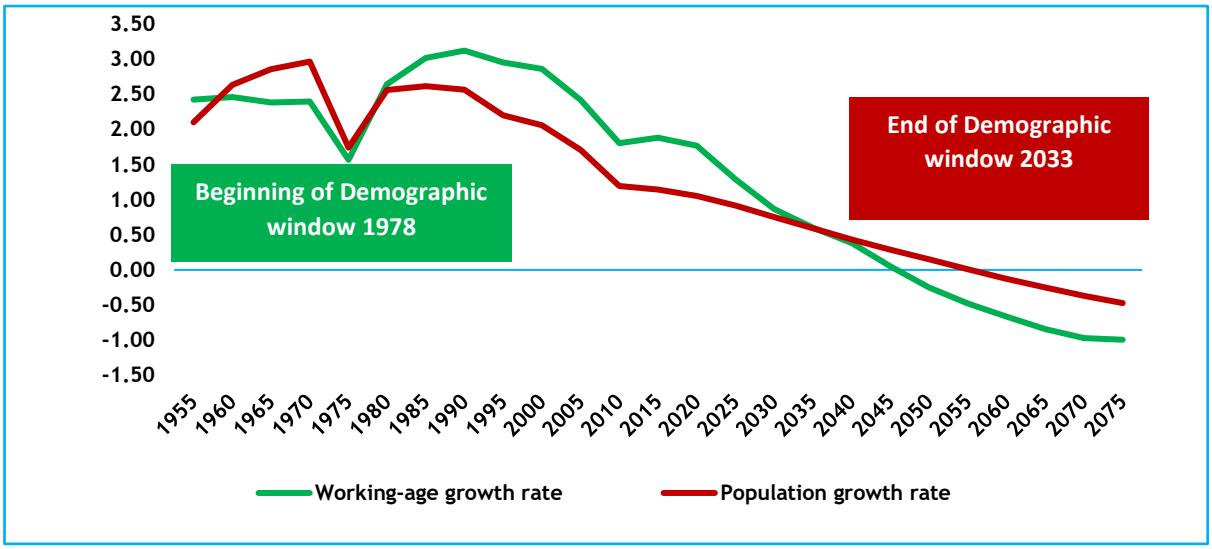
Source: BDP 2100

Driver 2: Demography and Labour force

In the growth theory, demographic transition plays a pivotal role in the growth contribution. Bloom, Canning and Malaney (2001) conducted a research on the East Asian growth miracle and pointed out that demographic shifts can explain most of the Asian economic miracle. Similar to the East Asian growth experience, Bangladesh has enjoyed a steady growth in the supply of labour of about 2.9 per cent per year between 1974 and 2012, as compared to a population growth rate of 2.1 per cent (Labour Force Survey, Bangladesh). The faster expansion of the labour force can be explained by two factors. ***First,*** due to the rising share of the population in the working-age group of 15 and above. ***Second,*** overall labour force participation has been increasing owing to the growing female workforce. Although the female participation rate has increased in Bangladesh, this rate remains quite low by international standards. Thus, Bangladesh has a potential favourable factor from population dividend for future growth prospects.

The demographic window of opportunity is the period when the proportion of a country's working-age population aged 15 to 64 years is pronounced compared with dependent populations, i.e. junior dependent population aged 0 to 14 years and senior dependent population aged 65 years and above. This means that the numbers of working people are larger than the non-working population. Thus, other things being equal, this is a more favourable situation for a country's economic development. In other words, it is a "sweet spot" in a country's development. However, the duration of the demographic window of opportunity differs from one country to another depending on how it has gone through its Health and Demographic Transition. In the case of Bangladesh, the share of the country's working-age population started to increase vis-à-vis the total population in 1978 which is the beginning of its demographic window of opportunity. It will start to shrink in 2033 which is the end of the country's demographic window of opportunity. Thus, altogether the duration of Bangladesh's demographic window of opportunity is 55 years and as of 2019, the country has passed 75 per cent of its demographic window of opportunity. This is shorter than that of Japan – one of the fastest ageing societies in the world – which enjoyed 59.5 years of demographic window of opportunity. It is also not so different from Asian "tiger economies" that have been enjoying a long period of economic growth.

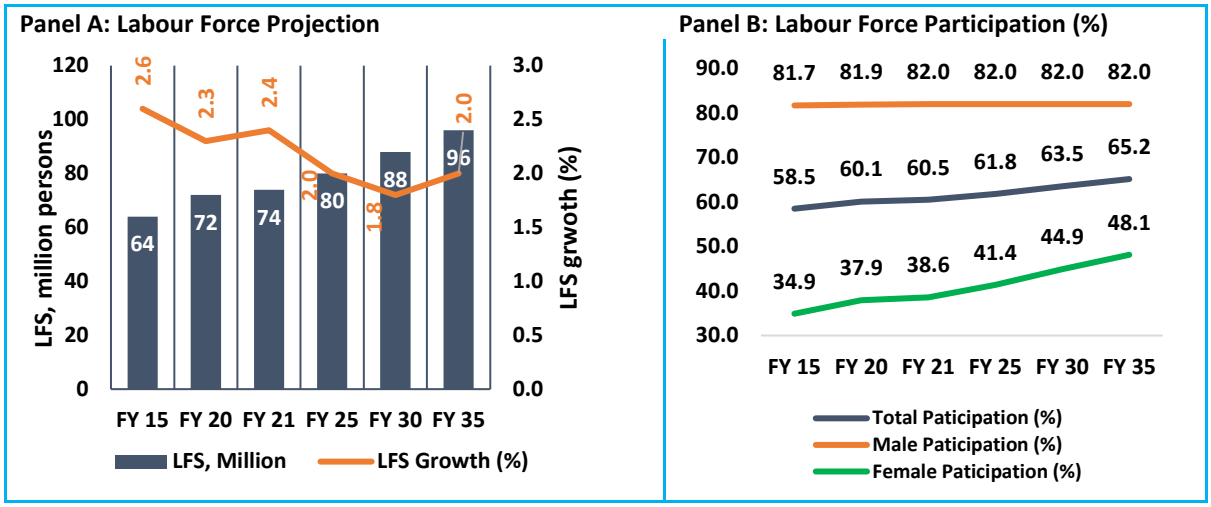
Figure 6. Bangladesh Demographic window



Cross-country evidence reveals that the persistent growth of the total labour force contributes to the growing accumulation. Since Bangladesh has a high potential to maintain the persistent labour force

growth, 1.9 per cent on an average from FY15 to FY30, and total labour force would reach 88 million at the end of FY30. The main driving forces behind the projection of the total labour force are - a significant share of young people who would remain during the period and the female participation rate would increase to 44.9 per cent from 34.9 per cent in FY15. This increase in female participation rate would happen due to the government's long-term strategies supporting female education, safety and empowerment issues through higher human capital investment and skill development programs during this period.

Figure 7. Labour Force projections



Driver 3: Total Factor Productivity (TFP) and Efficient Governance

Based on the endogenous growth model (Romar), it has been tried to explain the impact of total factor productivity (TFP) on long-term economic growth. In this model, TFP is endogenously determined, and all policies that contribute to more efficient use of factors of production can contribute to higher growth. TFP growth was 0.3 on average for the period from 2005 to 2016. In order to achieve high and sustained economic growth to be an upper-middle-income country by 2031 and a high-income country by 2046 TFP must grow at an average rate of 2.3 during the 2021-2031 period. Thus, it is imperative to increase the productivity of all factors of production. High productivity of factors of production depends on the increase in human capital investment and institutional efficiency, removing infrastructure gaps, higher enrollment ratio, and good governance.

Driver 4: High Manufacturing Growth led by Export Growth and Diversification

Over the last two decades, the export of Bangladesh increased steadily, which led to export-led manufacturing growth. It is expected that Bangladesh would continue to pursue export-led manufacturing growth relying on the implementation of favourable trade policies.

Table 3. Trends in Export Diversification (Some selected Asian countries)

Country	1990	2000	2010	2015
	(HHI Index Value)***			
Bangladesh	0.56	0.72	0.73	0.74
China	0.15	0.26	0.22	0.19
India	0.14	0.13	0.11	0.09
Republic of Korea	0.29	0.38	0.38	0.42
Vietnam	0.24	0.21	0.21	0.18

Source: ADB data and PRI staff estimates

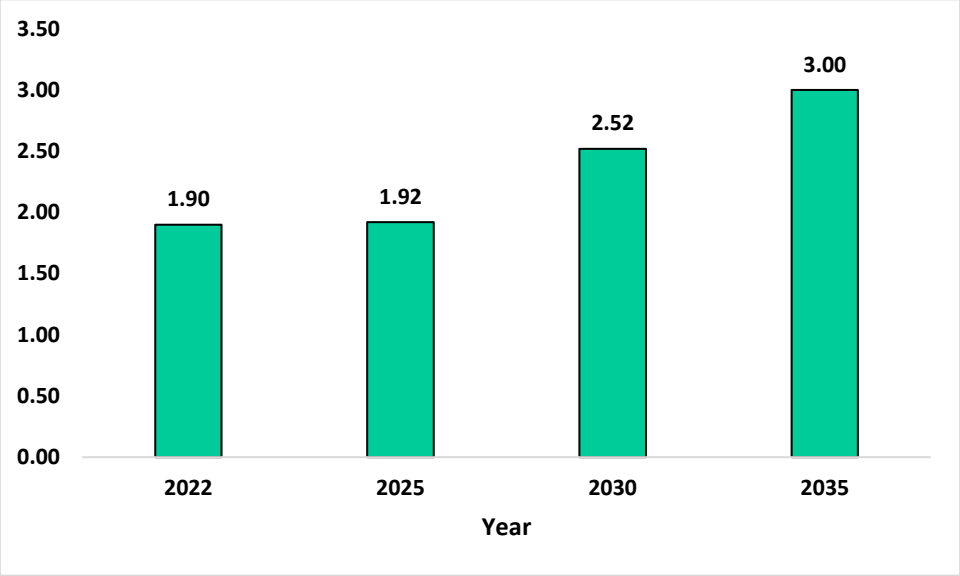
*** An HHI value closer to 1 means less diversification

But the export basket has been severely one-dimensional, heavily dependent on the apparel sector (82% of total export earnings) and has been continuously becoming less diverse according to HHI. Bangladesh needs to adopt export-promoting supporting measures – supporting exchange rate, trade and industrial policies.

Driver 5: Skill Development and Technology

Long-run economic growth cannot be accomplished without increased incomes and enhanced quality and quantity of production. These are ensured with increased productivity of the workers, which is guaranteed when proper skills are developed in the workforce. It is very important to meet the skill and technological needs of the production process so that the economy produces goods and services at an efficient level. However, it is quite a challenging task to establish an adequately skilled workforce. At the same time, keeping up with technological changes each day is also a highly difficult job since technology is evolving every day in the world. It is known how Total Factor Productivity (TFP) helps in determining sustainable economic growth. General Economics Division (GED)[2], Planning Commission, in their 2019 survey report, illustrated that at an industry level, livestock, fisheries, hotel and restaurant and manufacturing sector brought positive changes in TFP. Whereas industries like construction, transportation and communication, health and financial intermediations brought negative changes in TFP. The report also states that positive changes in TFP portray enhancement in the industry production efficiencies. These improvements are generated through better technology and greater knowledge of the production process.

Figure 8: Total Factor Productivity Growth (2022-2035)



5. Macro-Economic Outlook (2020 to 2035)

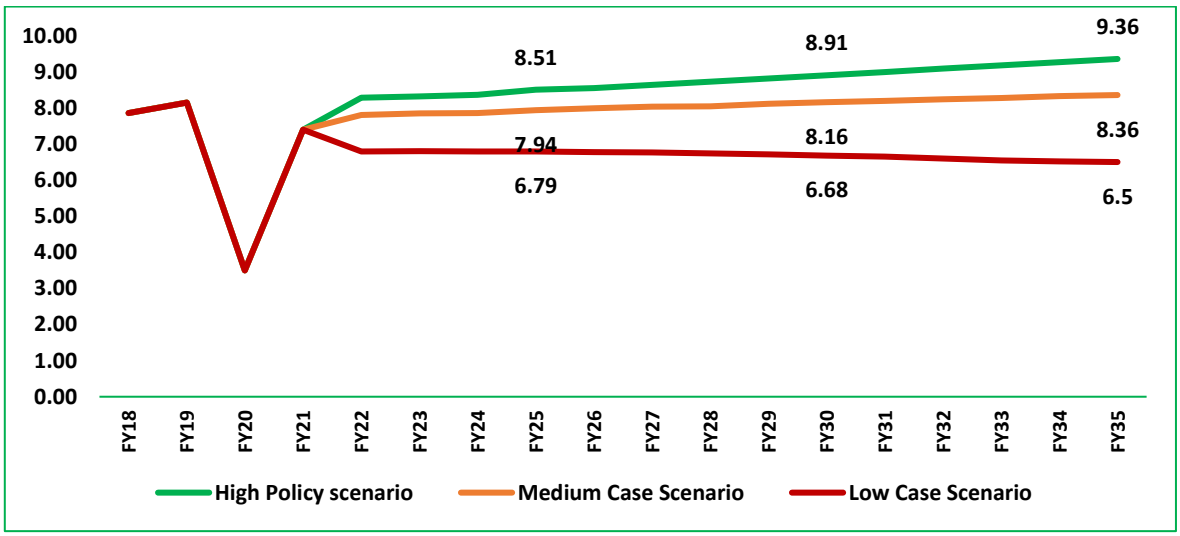
We consider three different types of Macroeconomic scenarios considering I/Y ratios; investment in human capital and productivity; female labour force participants and demographic dividend; and climate change and environment. **Scenario 1 is the High Policy Scenario** – it is the 8FYP policy scenario assuming a V-shaped recovery and high I/Y ratio, and an increase in productivity and adequate

[2] General Economics Division (2019)

investment (2% of GDP) to fend off climate change threats. **Scenario 2 is the Medium Policy Scenario** – this scenario is based on the assumption of an elongated U-shaped recovery. Furthermore, following the trends in the actual I/Y ratio, this scenario assumes that the I/Y ratio will be less by 2 percentage points compared to the high policy scenario. Productivity will be increasing but less than the rate assumed in the high policy scenario. Finally, delta project investment will be around 1 per cent of GDP. **Scenario 3 is the Low Case Scenario** – this scenario assumes that Bangladesh will not be able to mobilise funds for the Delta investments and thereby would fail to make the required investment as well as projects/programmes to fend off the climate and environmental threats (Please Annex 2 for details).

The variations in GDP growth rates under the three scenarios reflect the opportunity cost of non-fulfilment of the assumptions regarding the key drivers. Realizing some of the assumptions would be very challenging and require bold reforms on several fronts. But the opportunity cost of non-fulfilment could be as high as around 2.5 percentage points by 2030.

Figure 9. GDP growth rates under three scenarios (%)



Summary outcomes under the three scenarios are presented in the Table below.

Table 4. Summary of Three Scenarios

	Base Scenario	High Scenario			Medium Scenario			Low Scenario		
Key Outcome	***2022***	**2025**	**2030**	**2035**	**2025**	**2030**	**2035**	**2025**	**2030**	**2035**
Key Indicators:										
GDP Growth rate (%)	*7.25*	8.51	8.91	9.36	7.94	8.16	8.36	6.79	6.68	6.50
Upper Middle-Income Country			√			x			x	
Extreme poverty	*8.25*	5.71	3.95	1.68	5.92	3.4	1.82	6.36	4.02	2.10
Moderate Poverty	*17.06*	12.67	8.02	5.01	13.26	8.7	5.41	14	9.88	6.03
Key Drivers:										
I/Y ratio (%)	*32.50*	37.4	40.6	43.41	34.9	37.2	43.41	32	34.2	43.41
Public Investment to GDP	*7.54*	9.2	9.6	10.04	7.9	9	9.7	7.7	8.7	9.43
Private Investment to GDP	*24.96*	28.2	31	33.37	27.1	28.3	33.37	24.3	25.6	33.37
Labour force participation (%)	*60.5*	60.94	63.5	65.2	60.65	62.9	65.2	59.45	60.5	65.15
Male	*82.0*	81.69	82	82.0	81.6	81.8	82.0	81.45	81.5	82.00
Female	*38.6*	40.58	44.9	48.1	38.8	41.3	48.1	37.85	39.4	48.14
Employed People, In million	*70.02*	72.19	80.88	93.52	71.79	80.52	93.52	71.58	80.06	93.52
TFP Growth	*1.90*	2.12	2.91	3.12	1.92	2.52	3.00	1.4	1.65	2.95
Contribution of Capital	*3.94*	4.25	3.9	3.7	3.95	3.59	3.45	3.54	3.23	3.12
Contribution of Labour	*1.9*	2.13	2.1	2.0	2.06	2.04	2.02	1.79	1.77	1.75
Export/GDP ratio (%)	*12.74*	11.05	10.68	11.73	10.79	10.1	11.8	10.14	9.2	12.6
Remittance/GDP ratio (%)	*7.02*	4.27	3.4	3.5	4.35	3.5	3.6	4.52	3.9	4.0
FDI to GDP ratio (%)	*1.35*	3	3	3	1.7	2.2	3.0	1.45	1.95	3.0
Public Debt to GDP (%)	*36.3*	39.68	40.47	39.14	40.35	42.04	39.92	41.66	44.94	41.63
External	*19.7*	16.02	15.64	13.45	16.19	15.84	14.97	16.56	16.53	15.33
Domestic	*16.6*	23.66	24.83	25.69	24.16	26.2	24.95	25.09	28.41	26.30

Source: Bangladesh Macro-economic Framework

The macroeconomic outlooks of the three scenarios are presented in the following three tables. Each table consists of five sets of broad indicators.

Table 5. Macroeconomic indicators (High policy scenario)

Fiscal Year	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Real Sector Indicators:								(As % of GDP or Otherwise indicated)										
Real GDP growth	7.32	7.88	3.45	6.94	7.25	8.32	8.37	8.51	8.55	8.64	8.73	8.82	8.91	9.00	9.09	9.18	9.27	9.36
Inflation(CPI Base, % Change)	5.78	5.48	5.50	5.56	5.83	5.65	5.47	5.29	5.24	5.19	5.14	5.09	5.04	4.99	4.94	4.89	4.84	4.79
ICOR	4.27	4.01	4.00	4.08	4.16	4.24	4.32	4.40	4.49	4.51	4.52	4.54	4.56	4.57	4.59	4.60	4.62	4.64
Population Growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
								(As % of GDP or Otherwise indicated)										
Gross National Savings	27.42	29.50	29.65	29.78	28.70	33.93	34.78	35.98	36.91	37.42	37.93	38.41	38.88	39.37	39.86	40.37	40.88	41.42
Gross Investment	31.23	31.57	31.31	31.02	30.16	35.28	36.16	37.44	38.40	38.94	39.49	40.04	40.60	41.15	41.71	42.27	42.84	43.41
Public Investment (Including PPP)	7.97	8.03	7.29	7.32	8.59	8.68	8.86	9.24	9.32	9.40	9.48	9.56	9.64	9.72	9.80	9.88	9.96	10.04
Private Investment (Including PPP)	23.26	23.54	24.02	23.70	24.00	25.60	27.30	28.20	29.08	29.54	30.01	30.48	30.96	31.43	31.91	32.39	32.88	33.37
Foreign Direct Investment(FDI)	0.71	0.88	0.99	0.93	1.35	1.90	2.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Domestic Investment	22.55	22.66	23.03	22.77	22.65	23.70	24.80	25.20	26.08	26.54	27.01	27.48	27.96	28.43	28.91	29.39	29.88	30.37
Consumption	77.17	74.98	75.15	77.17	75.80	73.82	71.79	70.41	69.26	68.51	67.73	66.97	66.19	65.38	64.57	63.74	62.89	62.04
GNI Per Capita USD	1702	1909	2020	2269	2348	2571	2818	3092	3395	3730	4101	4513	4972	5482	6051	6685	7394	8186
Population in million	165.1	167.5	169.8	172.1	174.2	176.3	178.4	180.5	182.6	184.6	186.7	188.7	190.6	192.6	194.5	196.4	198.3	200.1
Population growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
Fiscal Indicators:								**(As % of GDP or Otherwise indicated)**										
Revenue and Grants	9.66	9.97	9.82	10.21	11.64	12.04	12.89	14.09	15.28	16.38	17.37	18.27	19.06	19.55	20.00	20.45	20.90	21.35
Total Revenue	9.62	9.90	9.69	10.08	11.60	12.00	12.86	14.06	15.26	16.36	17.36	18.26	19.06	19.55	20.00	20.45	20.90	21.35
Tax Revenue	8.64	8.89	8.43	9.03	10.30	10.60	11.26	12.26	13.26	14.26	15.26	16.16	16.96	17.35	17.80	18.25	18.70	19.15
NBR Tax Revenue	8.31	8.60	7.98	8.55	9.90	10.10	10.66	11.56	12.51	13.46	14.41	15.26	16.01	16.35	16.70	17.05	17.40	17.75
Non-NBR Tax Revenue	0.32	0.29	0.45	0.48	0.40	0.50	0.60	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.10	1.20	1.30	1.40
Non-Tax Revenue	0.99	1.02	1.26	1.05	1.30	1.40	1.60	1.80	2.00	2.10	2.10	2.10	2.10	2.20	2.20	2.20	2.20	2.20
Grants	0.04	0.06	0.12	0.13	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Expenditure	14.30	15.17	18.05	18.11	17.39	17.56	17.89	19.09	20.28	21.38	22.37	23.27	24.06	24.55	25.00	25.45	25.90	26.35
Non-Development Expenditure	8.51	9.30	10.64	11.11	10.84	10.92	11.09	11.91	13.04	14.06	14.99	15.81	16.54	16.96	17.34	17.72	18.10	18.49
Development Expenditure	5.43	5.94	7.29	6.87	6.41	6.49	6.66	7.03	7.09	7.16	7.23	7.30	7.37	7.44	7.51	7.58	7.65	7.72
Overall Balance (Incl. grants)	-4.64	-5.20	-8.24	-7.90	-5.75	-5.52	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00
Financing	4.64	5.20	8.24	7.90	5.75	5.52	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Net External Financing	1.14	1.23	1.90	2.43	2.45	2.47	2.49	2.51	2.10	2.00	1.85	1.75	1.65	1.25	1.23	1.21	1.19	1.17
Domestic financing	3.50	3.97	6.34	5.48	3.30	3.05	2.51	2.49	2.90	3.00	3.15	3.25	3.35	3.75	3.77	3.79	3.81	3.83
Debt Indicators								**(As % of GDP or Otherwise indicated)**										
Total Debt outstanding	31.90	33.10	38.00	34.72	36.34	37.28	37.61	37.92	38.19	38.42	38.61	38.76	38.88	38.98	39.05	39.10	39.13	39.14
External Debt	12.20	12.10	18.30	19.60	19.71	19.69	19.72	19.76	19.40	18.98	18.45	17.88	17.28	16.35	15.51	14.76	14.07	13.45
Domestic Debt	19.70	21.00	19.70	15.12	16.63	17.58	17.90	18.16	18.79	19.45	20.16	20.88	21.60	22.63	23.53	24.34	25.06	25.70
Total Debt Services (As % of GDP)	2.19	2.31	2.36	1.97	2.17	2.25	2.28	2.30	2.35	2.39	2.43	2.49	2.55	2.67	2.83	2.88	2.93	2.97
External	0.49	0.53	0.73	0.73	0.83	0.85	0.87	0.89	0.90	0.91	0.92	0.93	0.93	0.98	1.07	1.06	1.05	1.05
Domestic	1.70	1.78	1.64	1.24	1.35	1.41	1.41	1.42	1.45	1.48	1.51	1.57	1.62	1.70	1.77	1.83	1.88	1.93
External debt as% export& remittance	64.04	66.40	118.99	116.01	111.61	113.07	114.75	116.64	116.25	115.63	114.49	113.16	111.63	107.91	104.68	101.89	99.45	97.31
External debt services as% export& remittance	2.59	2.81	4.72	4.35	4.68	4.85	5.04	5.23	5.39	5.55	5.70	5.86	6.01	6.44	7.19	7.30	7.43	7.57
External Indicators:								**(Percentage Change(%) or Otherwise Indicated)**										
Export growth	6.66	10.09	-19.59	14.89	10.30	10.45	10.60	10.75	10.90	11.05	11.20	11.35	11.50	11.65	11.75	11.85	11.95	12.05
Import growth	25.23	1.79	-8.57	19.59	9.00	9.00	10.00	10.50	10.00	10.00	10.00	10.20	10.20	10.20	10.20	10.20	10.20	10.20
Remittance growth	17.33	9.60	2.32	0.00	8.40	8.00	8.00	8.00	7.45	6.90	6.35	5.80	5.25	4.70	4.15	3.60	3.05	2.50
Current Account Balance as (%) of GDP	-3.56	-1.75	-1.66	-1.24	-1.46	-1.35	-1.38	-1.46	-1.49	-1.52	-1.56	-1.64	-1.71	-1.78	-1.85	-1.91	-1.95	-1.99
Net MLT as % of GDP	1.14	1.23	1.90	2.43	2.45	2.47	2.49	2.51	2.10	2.00	1.85	1.75	1.65	1.25	1.23	1.21	1.19	1.17
Exchange Rate(Tk/USD)	83.73	84.50	84.80	85.80	92.95	95.81	98.58	101.27	103.97	106.70	109.45	112.22	115.00	117.79	120.59	123.41	126.22	129.04
Reserves , months of imports of goods and services	6.00	6.50	7.44	7.02	7.51	8.42	9.61	10.99	12.06	13.01	13.80	14.44	14.95	15.15	15.30	15.44	15.55	15.65
Monetary Indicators:								**(Percentage Change(%) or Otherwise Indicated)**										
Broad Money	9.24	9.88	12.00	11.20	12.15	12.88	13.24	13.50	14.24	14.28	14.32	14.36	14.40	14.44	14.48	14.52	14.56	14.60
Private sector Credit	16.94	11.29	12.50	11.70	12.65	13.38	13.74	14.00	14.74	14.78	14.82	14.86	14.90	14.94	14.98	15.02	15.06	15.10

Source: BBS, MOF, BB, and Author's Projection

Table 6. Macroeconomic indicators (Medium policy scenario)

Fiscal Year	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Real Sector Indicators:									**(As % of GDP or Otherwise indicated)**									
Real GDP growth	7.32	7.88	3.45	6.94	7.25	7.85	7.86	7.94	7.99	8.04	8.04	8.12	8.16	8.20	8.24	8.28	8.33	8.36
Inflation(CPI Base, % Change)	5.78	5.48	5.50	5.56	5.83	5.65	5.47	5.29	5.24	5.19	5.14	5.09	5.04	4.99	4.94	4.89	4.84	4.79
ICOR	4.27	4.01	4.00	4.08	4.48	4.24	4.33	4.40	4.49	4.50	4.53	4.53	4.56	4.57	4.59	4.60	4.62	4.64
Population Growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
									(As % of GDP or Otherwise indicated)									
Gross National Savings	27.42	29.50	29.65	27.26	31.04	31.92	32.70	33.67	34.70	34.99	35.15	35.49	35.80	37.64	38.23	38.83	39.45	40.08
Gross Investment	31.23	31.57	31.31	28.50	32.50	33.30	34.00	34.90	35.90	36.20	36.40	36.80	37.20	41.15	41.71	42.27	42.84	43.41
Public Investment (Including PPP)	7.97	8.03	7.29	7.32	7.54	7.76	7.98	8.20	8.42	8.64	8.86	9.08	9.30	9.38	9.46	9.54	9.62	9.70
Private Investment (Including PPP)	23.26	23.54	24.02	23.70	24.96	25.54	26.02	26.70	27.48	27.56	27.54	27.72	27.90	31.43	31.91	32.39	32.88	33.37
Foreign Direct Investment(FDI)	0.71	0.88	0.99	0.93	1.35	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	3.00	3.00	3.00	3.00	3.00
Domestic Investment	22.55	22.66	23.03	22.77	23.61	24.04	24.42	25.00	25.68	25.66	25.54	25.62	25.70	28.43	28.91	29.39	29.88	30.37
Consumption	77.17	74.98	75.15	77.17	75.89	74.86	73.93	72.81	71.60	71.09	70.69	70.10	69.51	65.66	64.84	64.01	63.17	62.32
GNI Per Capita USD	1702	1909	2020	2269	2348	2561	2794	3051	3333	3642	3981	4354	4765	5253	5797	6404	7082	7840
Population in million	165.1	167.5	169.8	172.1	174.2	176.3	178.4	180.5	182.6	184.6	186.7	188.7	190.6	192.6	194.5	196.4	198.3	200.1
Population growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
Fiscal Indicators:									**(As % of GDP or Otherwise indicated)**									
Revenue and Grants	9.66	9.97	9.82	9.86	11.04	11.74	12.43	13.43	14.27	15.12	15.96	16.71	17.35	19.55	20.00	20.45	20.90	21.35
Total Revenue	9.62	9.90	9.69	9.73	11.00	11.70	12.40	13.40	14.25	15.10	15.95	16.70	17.35	19.55	20.00	20.45	20.90	21.35
Tax Revenue	8.64	8.89	8.43	8.68	9.70	10.30	10.80	11.60	12.25	13.00	13.85	14.60	15.25	17.35	17.80	18.25	18.70	19.15
NBR Tax Revenue	8.31	8.60	7.98	8.20	9.30	9.80	10.20	10.90	11.50	12.20	13.00	13.70	14.30	16.35	16.70	17.05	17.40	17.75
Non-NBR Tax Revenue	0.32	0.29	0.45	0.48	0.40	0.50	0.60	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.10	1.20	1.30	1.40
Non-Tax Revenue	0.99	1.02	1.26	1.05	1.30	1.40	1.60	1.80	2.00	2.10	2.10	2.10	2.10	2.20	2.20	2.20	2.20	2.20
Grants	0.04	0.06	0.12	0.13	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Expenditure	14.30	15.17	16.35	17.23	16.79	17.26	17.53	18.53	19.37	20.22	21.06	21.81	22.45	24.55	25.00	25.45	25.90	26.35
Non-Development Expenditure	8.51	9.30	10.64	11.11	11.29	11.54	11.61	12.39	13.03	13.66	14.30	14.83	15.27	17.30	17.68	18.06	18.44	18.83
Development Expenditure	5.43	5.94	5.59	5.98	5.36	5.57	5.78	5.99	6.19	6.40	6.61	6.82	7.03	7.10	7.17	7.24	7.31	7.38
Overall Balance (Incl. grants)	-4.64	-5.20	-6.53	-7.37	-5.75	-5.52	-5.10	-5.10	-5.10	-5.10	-5.10	-5.10	-5.10	-5.00	-5.00	-5.00	-5.00	-5.00
Financing	4.64	5.20	6.53	7.37	5.75	5.52	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.00	5.00	5.00	5.00	5.00
Net External Financing	1.14	1.23	1.90	2.43	2.45	2.46	2.48	2.50	2.20	2.00	1.80	1.65	1.50	1.52	1.54	1.55	1.57	1.59
Domestic financing	3.50	3.97	4.63	4.94	3.30	3.06	2.62	2.60	2.90	3.10	3.30	3.45	3.60	3.48	3.46	3.45	3.43	3.41
Debt Indicators									**(As % of GDP or Otherwise indicated)**									
Total Debt outstanding	31.90	33.10	38.00	34.72	36.34	37.41	37.99	38.53	39.00	39.42	39.80	40.13	40.42	40.32	40.22	40.12	40.02	39.92
External Debt	12.20	12.10	18.30	19.60	19.71	19.77	19.86	19.97	19.78	19.40	18.88	18.27	17.58	16.88	16.28	15.77	15.34	14.97
Domestic Debt	19.70	21.00	19.70	15.12	16.63	17.65	18.13	18.55	19.22	20.02	20.92	21.86	22.84	23.44	23.94	24.35	24.69	24.95
Total Debt Services (As % of GDP)	2.19	2.31	2.36	1.97	2.17	2.26	2.30	2.34	2.39	2.44	2.50	2.57	2.65	2.75	2.88	2.92	2.94	2.97
External	0.49	0.53	0.73	0.73	0.83	0.85	0.87	0.89	0.91	0.92	0.93	0.93	0.94	0.99	1.09	1.09	1.09	1.10
Domestic	1.70	1.78	1.64	1.24	1.35	1.41	1.43	1.45	1.48	1.52	1.57	1.64	1.71	1.76	1.80	1.83	1.85	1.87
External debt as% export& remittance	64.04	66.40	118.9	116.0	111.6	113.0	114.6	116.4	116.6	115.9	114.5	112.5	110.2	108.5	107.4	106.9	106.9	107.35
			9	1	1	5	7	8	7	9	1	9	3	3	6	5	3	
External debt services as% export& remittance	2.59	2.81	4.72	4.35	4.68	4.84	5.01	5.19	5.34	5.49	5.63	5.75	5.87	6.35	7.18	7.38	7.62	7.87
External Indicators:									**(Percentage Change(%) or Otherwise Indicated)**									
Export growth	6.66	10.09	-19.59	14.89	10.30	10.38	10.46	10.54	10.62	10.70	10.78	10.86	10.94	11.09	11.19	11.29	11.39	11.49
Import growth	25.23	1.79	-8.57	19.59	9.00	9.10	9.20	9.30	9.40	9.50	9.60	9.70	9.80	10.20	10.20	10.20	10.20	10.20
Remittance growth	17.33	9.60	2.32	0.00	8.40	8.00	8.00	8.00	7.45	6.90	6.35	5.80	5.25	4.70	4.15	3.60	3.05	2.50
Current Account Balance as (%) of GDP	-3.56	-1.75	-1.66	-1.24	-1.46	-1.38	-1.30	-1.23	-1.20	-1.21	-1.25	-1.31	-1.40	-1.54	-1.67	-1.79	-1.90	-2.00
Net MLT as % of GDP	1.14	1.23	1.90	2.43	2.45	2.46	2.48	2.50	2.20	2.00	1.80	1.65	1.50	1.52	1.54	1.55	1.57	1.59
Exchange Rate(Tk/USD)	83.73	84.50	84.80	85.80	92.95	95.81	98.58	101.2	103.9	106.7	109.4	112.2	115.0	117.7	120.5	123.4	126.2	129.04
								7	7	0	5	2	0	9	9	1	2	
Reserves , months of imports of goods and services	6.00	6.50	7.46	7.10	7.58	8.21	8.96	9.80	10.50	11.12	11.63	12.04	12.36	13.11	13.76	14.33	14.83	15.27
Monetary Indicators:									**(Percentage Change(%) or Otherwise Indicated)**									

Fiscal Year	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Broad Money	9.24	9.88	12.00	11.20	12.15	12.88	13.24	13.50	13.65	13.65	13.59	13.62	13.61	14.44	14.48	14.52	14.56	14.60
Private sector Credit	16.94	11.29	12.50	11.70	12.65	13.38	13.74	14.00	14.15	14.15	14.09	14.12	14.11	14.94	14.98	15.02	15.06	15.10

Source: BBS, MOF, BB, and Author's Projection

Table 7. Macroeconomic indicators (Low policy scenario)

Fiscal Year	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Real Sector Indicators:									(As % of GDP or Otherwise indicated)									
Real GDP growth	7.32	7.88	3.45	6.94	7.25	6.80	6.80	6.79	6.78	6.77	6.74	6.71	6.68	6.65	6.60	6.55	6.52	6.50
Inflation(CPI Base, % Change)	5.78	5.48	5.50	5.56	5.83	5.68	5.53	5.38	5.33	5.28	5.23	5.18	5.13	4.97	4.81	4.65	4.49	4.33
ICOR	4.27	4.01	4.00	4.08	4.10	4.47	4.57	4.71	4.85	4.92	4.96	5.05	5.12	4.57	4.59	4.60	4.62	4.64
Population Growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
									(As % of GDP or Otherwise indicated)									
Gross National Savings	27.42	29.50	29.65	27.26	28.24	29.01	29.79	30.76	31.70	32.10	32.18	32.63	32.85	37.64	38.23	38.83	39.45	40.08
Gross Investment	31.23	31.57	31.31	28.50	29.70	30.40	31.10	32.00	32.90	33.30	33.40	33.90	34.20	41.15	41.71	42.27	42.84	43.41
Public Investment (Including PPP)	7.97	8.03	7.29	7.32	7.51	7.70	7.89	8.08	8.27	8.46	8.65	8.84	9.03	9.11	9.19	9.27	9.35	9.43
Private Investment (Including PPP)	23.26	23.54	24.02	23.70	22.19	22.70	23.21	23.92	24.63	24.84	24.75	25.06	25.17	31.43	31.91	32.39	32.88	33.37
Foreign Direct Investment(FDI)	0.71	0.88	0.99	0.93	1.05	1.25	1.35	1.45	1.55	1.65	1.75	1.85	1.95	3.00	3.00	3.00	3.00	3.00
Domestic Investment	22.55	22.66	23.03	22.77	21.14	21.45	21.86	22.47	23.08	23.19	23.00	23.21	23.22	28.43	28.91	29.39	29.88	30.37
Consumption	77.17	74.98	75.15	77.17	78.69	77.83	76.97	75.92	74.86	74.31	74.06	73.41	72.97	65.66	64.84	64.01	63.17	62.32
GNI Per Capita USD	1702	1909	2020	2269	2348	2537	2743	2965	3205	3464	3743	4042	4365	4811	5308	5861	6480	7172
Population in million	165.1	167.5	169.8	172.1	174.2	176.3	178.4	180.5	182.6	184.6	186.7	188.7	190.6	192.6	194.5	196.4	198.3	200.1
Population growth	1.43	1.41	1.39	1.34	1.24	1.22	1.19	1.18	1.14	1.13	1.09	1.08	1.04	1.03	0.99	0.98	0.94	0.93
Fiscal Indicators:									(As % of GDP or Otherwise indicated)									
Revenue and Grants	9.66	9.97	9.82	9.86	10.74	11.34	12.03	12.83	13.67	14.42	15.16	15.91	16.55	19.55	20.00	20.45	20.90	21.35
Total Revenue	9.62	9.90	9.69	9.73	10.70	11.30	12.00	12.80	13.65	14.40	15.15	15.90	16.55	19.55	20.00	20.45	20.90	21.35
Tax Revenue	8.64	8.89	8.43	8.68	9.40	9.90	10.40	11.00	11.65	12.30	13.05	13.80	14.45	17.35	17.80	18.25	18.70	19.15
NBR Tax Revenue	8.31	8.60	7.98	8.20	9.00	9.40	9.80	10.30	10.90	11.50	12.20	12.90	13.50	16.35	16.70	17.05	17.40	17.75
Non-NBR Tax Revenue	0.32	0.29	0.45	0.48	0.40	0.50	0.60	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.10	1.20	1.30	1.40
Non-Tax Revenue	0.99	1.02	1.26	1.05	1.30	1.40	1.60	1.80	2.00	2.10	2.10	2.10	2.10	2.20	2.20	2.20	2.20	2.20
Grants	0.04	0.06	0.12	0.13	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Expenditure	14.30	15.17	16.35	17.23	16.49	16.86	17.23	18.03	18.87	19.62	20.36	21.11	21.75	24.55	25.00	25.45	25.90	26.35
Non-Development Expenditure	8.51	9.30	10.64	11.11	11.02	11.20	11.40	12.01	12.68	13.24	13.81	14.37	14.84	17.57	17.95	18.33	18.71	19.10
Development Expenditure	5.43	5.94	5.59	5.98	5.33	5.51	5.69	5.87	6.04	6.22	6.40	6.58	6.76	6.83	6.90	6.97	7.04	7.11
Overall Balance (Incl. grants)	-4.64	-5.20	-6.53	-7.37	-5.75	-5.52	-5.20	-5.20	-5.20	-5.20	-5.20	-5.20	-5.20	-5.00	-5.00	-5.00	-5.00	-5.00
Financing	4.64	5.20	6.53	7.37	5.75	5.52	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.00	5.00	5.00	5.00	5.00
Net External Financing	1.14	1.23	1.90	2.43	2.44	2.45	2.46	2.48	2.18	1.90	1.75	1.60	1.45	1.47	1.49	1.50	1.52	1.54
Domestic financing	3.50	3.97	4.63	4.94	3.31	3.07	2.74	2.72	3.02	3.30	3.45	3.60	3.75	3.53	3.51	3.50	3.48	3.46
Debt Indicators									(As % of GDP or Otherwise indicated)									
Total Debt outstanding	31.90	33.10	38.00	34.72	36.34	37.72	38.67	39.56	40.37	41.12	41.81	42.45	43.05	42.62	42.28	42.00	41.79	41.63
External Debt	12.20	12.10	18.30	19.60	19.71	19.91	20.13	20.37	20.29	19.95	19.51	18.98	18.38	17.53	16.82	16.22	15.73	15.33
Domestic Debt	19.70	21.00	19.70	15.12	16.63	17.80	18.53	19.19	20.08	21.17	22.29	23.46	24.67	25.09	25.46	25.78	26.06	26.30
Total Debt Services (As % of GDP)	2.19	2.31	2.36	1.97	2.17	2.27	2.34	2.39	2.46	2.54	2.61	2.71	2.80	2.89	3.01	3.04	3.06	3.08
External	0.49	0.53	0.73	0.73	0.83	0.85	0.87	0.90	0.92	0.93	0.94	0.95	0.95	1.00	1.10	1.10	1.10	1.11
Domestic	1.70	1.78	1.64	1.24	1.35	1.42	1.46	1.50	1.55	1.61	1.67	1.76	1.85	1.88	1.91	1.93	1.95	1.97
External debt as% export& remittance	64.04	66.40	118.99	116.01	111.58	112.81	114.08	115.38	115.08	113.45	111.38	108.88	105.98	103.88	102.53	101.85	101.77	102.23
External debt services as% export& remittance	2.59	2.81	4.72	4.35	4.68	4.81	4.94	5.08	5.19	5.28	5.37	5.44	5.50	5.94	6.73	6.92	7.15	7.40
External Indicators:									(Percentage Change(%) or Otherwise Indicated)									
Export growth	6.66	10.09	-19.59	14.89	10.30	10.34	10.38	10.42	10.46	10.50	10.54	10.58	10.62	10.77	10.87	10.97	11.07	11.17
Import growth	25.23	1.79	-8.57	19.59	9.00	9.04	9.08	9.12	9.16	9.20	9.24	9.28	9.32	10.20	10.20	10.20	10.20	10.20
Remittance growth	17.33	9.60	2.32	0.00	8.40	8.00	8.00	8.00	7.45	6.90	6.35	5.80	5.25	4.70	4.15	3.60	3.05	2.50
Current Account Balance as (%) of GDP	-3.56	-1.75	-1.66	-1.24	-1.46	-1.39	-1.31	-1.24	-1.20	-1.20	-1.22	-1.27	-1.35	-1.54	-1.72	-1.89	-2.05	-2.19
Net MLT as % of GDP	1.14	1.23	1.90	2.43	2.44	2.45	2.46	2.48	2.18	1.90	1.75	1.60	1.45	1.47	1.49	1.50	1.52	1.54
Exchange Rate(Tk/USD)	83.73	84.50	84.80	85.80	92.95	95.83	98.67	101.44	104.24	107.07	109.92	112.79	115.69	118.47	121.14	123.69	126.09	128.34

Fiscal Year	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Reserves , months of imports of goods and services	6.00	6.50	7.46	7.10	7.40	7.88	8.46	9.13	9.68	10.11	10.47	10.76	10.96	11.66	12.24	12.71	13.09	13.40
Monetary Indicators:	(Percentage Change(%) or Otherwise Indicated)																	
Broad Money	9.24	9.88	12.00	11.20	12.15	12.88	13.24	13.50	12.47	12.41	12.32	12.24	12.15	14.42	14.34	14.26	14.18	14.10
Private sector Credit	16.94	11.29	12.50	11.70	12.65	13.38	13.74	14.00	12.97	12.91	12.82	12.74	12.65	14.92	14.84	14.76	14.68	14.60

Source: BBS, MOF, BB, and Author's Projection

6. Skill Gap Analysis of Labour Market in Bangladesh

In order to determine the skill gap in the labour market of Bangladesh, the study compares the existing supply of labour across skill levels in the country's labour market using the LFS 2016-17 with the projection of demand for labour across skill levels by the World Bank (2018). To understand the supply of labour across skill levels, using the LFS 2016-17 data, the study first categorizes skill levels into three groups: Low skill, medium skill and high skill. The classification of three types of skill sets has been defined by the conditions presented in Table 8 and Table 9. Table 8 depicts the classification of skills without training. Table 9 shows the classification of skills with training.

Table 8. Classification of skills without training

Without Training	
Skills	**Education[3]**
Low	0-5th
Medium	6th-12th
High	HSC onwards

Source: Authors' specification

Table 9. Classification of skills with training

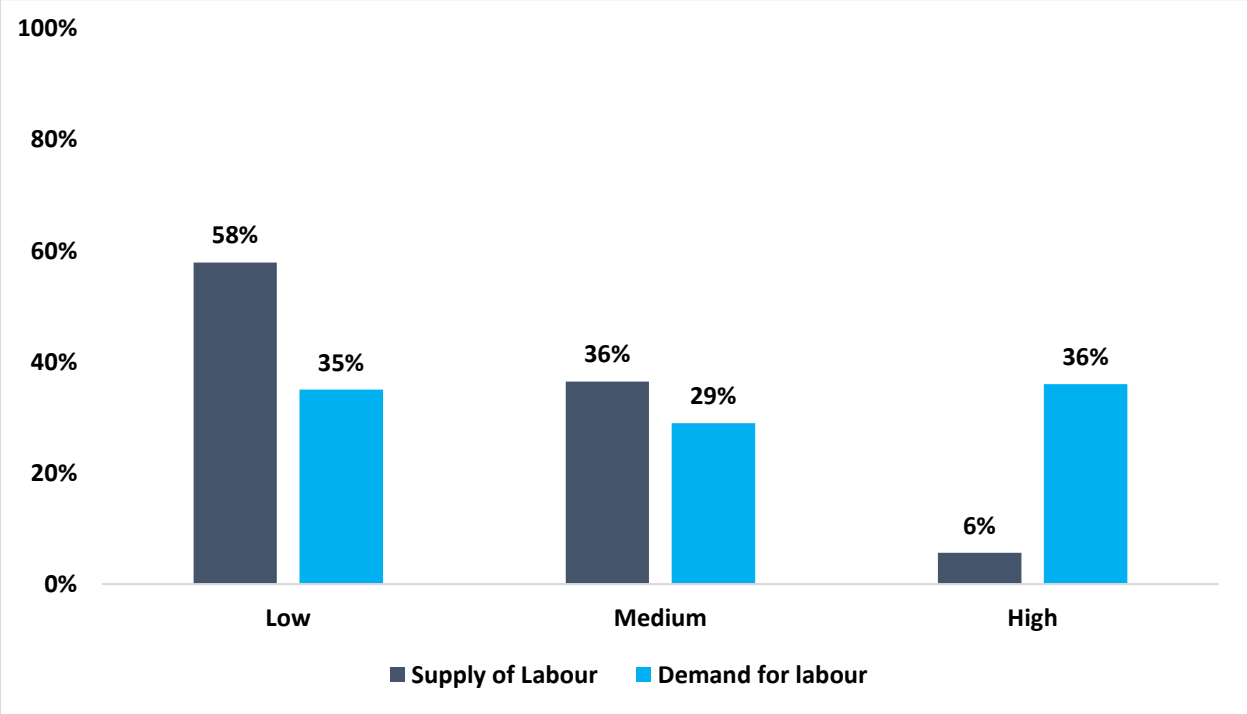
With Training	
Skills	**Education**
Low	No Education
Medium	0-5th
High	6th-12th

Source: Authors' specification

In contrast, the demand for labour across skill levels has been identified based on a study conducted by the World Bank (2018). The study then analyzes the labour share of skills from the perspectives of supply and demand to determine the gap between the two. The study finds that among the total labour force or labour supply in the economy, 58% consists of low-skilled, followed by medium-skilled (36%) and high-skilled (6%). On the other hand, the country's industries demand a low-skilled workforce of 35%, followed by medium-skilled (29%) and high-skilled (36%). From the estimates, it can be inferred that there is a huge gap between the supply of and demand for labour across skill levels.

[3] Education refers to years of schooling.

Figure 10: Labour supply and labour demand across skill levels (%)



Source: Authors' estimation based on LFS 2016-17 and World Bank (2018)

The skill gap also varies across the sectors. According to Murshid (2016), the existing skill gap is the greatest in the agro-processing industry followed by Ready Made Garment (RMG). In the case of the IT and leather sectors, the skill gap for 'skilled employees' is around 40%. Overall, in each sector, skilled and semi-skilled workers are in short supply.

The study also projects demand for labour for some selected sectors from 2015 to 2035. The selected sectors are Agro-processing Industry, Construction, Healthcare, Hospitality and Tourism, ICT, Leather Goods, Light Engineering, RMG and Ship Building. From the projection, sector-wise variation of demand for labour across skill levels has been observed. The highest percentage increase has been observed in the shipbuilding and agro-processing food industry. In both absolute and percentage terms, labour and skill demand for RMG is also massive. The IT sector demands only a skilled workforce which also shows a sharp rise from a low base.

Table 10. Present and future labour demand for some selected sectors

Sectors	Skill levels	2015	2020	2025	2030	2035
Agro Food	Skilled	245,000	390,000	639,000	818,667	1,044,556
	Semi-skilled	258,000	411,000	673,000	862,333	1,100,111
	Unskilled	142,000	226,000	370,000	474,000	604,667
Construction	Skilled	1,010,000	1,220,000	1,540,000	1,786,667	2,082,222
	Semi-skilled	1,260,000	1,530,000	1,920,000	2,230,000	2,593,333
	Unskilled	910,000	1,110,000	1,390,000	1,616,667	1,878,889
Healthcare	Overall	89,000	129,000	198,000	247,667	310,222
	Skilled	37,000	43,000	50,000	56,333	63,111

Sectors	Skill levels	2015	2020	2025	2030	2035
Hospitality & Tourism	Semi-skilled	67,000	76,000	89,000	99,333	111,444
	Unskilled	190,000	217,000	253,000	283,000	317,000
ICT	Overall	220,000	310,000	440,000	543,333	664,444
Leather Goods	Skilled	8,404	11,727	17,404	21,512	26,666
	Semi-skilled	8,144	11,365	16,867	20,848	25,843
	Unskilled	83,990	117,203	173,943	214,998	266,510
Light Engineering	Skilled	560,358	900,324	900,324	1,126,968	1,202,516
	Semi-skilled	164,813	189,563	189,563	206,063	211,563
	Unskilled	6,631	7,529	7,529	8,128	8,327
RMG	Skilled	2,258,250	3,666,460	5,027,463	6,419,937	7,791,431
	Semi-skilled	1,230,164	1,345,477	1,829,871	2,068,211	2,470,587
	Unskilled	618,708	444,347	599,091	534,432	616,041
Ship Building	Skilled	2,767	7,061	21,509	29,188	41,379
	Semi-skilled	12,547	32,019	97,533	132,352	187,635
	Unskilled	15,075	38,473	117,192	159,030	225,456

Note: The projection from 2020-2025 was taken from Murshid (2016) and based on these projections, the study projected demand for labour up to 2035

7. Conclusion and Policy Recommendations

Before the onset of the COVID-19 pandemic, Bangladesh's economy was predicted to see a year in terms of its economic development indicators like GDP growth and poverty rates. GDP was expected to see the largest contributions from the RMG/Textile, Construction and Agriculture sectors. However, the whole scenario changed when the pandemic hit the country in early 2020. Most growth-driving indicators were hit hard including exports of goods and services to foreign countries as the exchange was out of the scenario during that time. Due to the COVID-19 crisis, Bangladesh faced some serious economic challenges and was soon able to recover from it in terms of the major macroeconomic indicators. However, due to the onset of the Russia-Ukraine conflict this year, the recovery progress is set back to a great extent. The main goal of this study is to project the macroeconomic outlooks for the years between 2020 and 2035 and to see where the economy is heading after going through various economic difficulties. The analytical framework chosen for the Bangladesh Delta Plan is an extension of the approach employed in this report. The analytical framework is made up of four interconnected models: a macroeconomic model, a satellite module on employment, a module on poverty, and a module on the environment.

The relationship between capital accumulation and economic growth is found to be positively correlated across countries, according to the study. Bangladesh needs to increase its investment to at least 40.6% of GDP in 2030 from just under 28.3% of GDP in 2020 in order to meet the target of achieving about 9% growth (high policy scenario). Additionally, when considering cross-country experience, a positive association between investment and GDP growth rate can be seen. Moreover, the government must

simultaneously work to develop the financial industry by concentrating on three sectors: the money market, the insurance market, and the bond market. In Bangladesh, both the money market and the insurance industry are sufficiently established. However, Bangladesh does not have a bond market and must enhance the markets to promote financial growth. Further, Bangladesh has enjoyed a steady growth in the supply of labour. The faster expansion of the labour force is attributed to the rising share of the population in the working-age group of 15 and above, overall labour force participation has been increasing owing to the growing female workforce. Over the last two decades, the export of Bangladesh has increased steadily, which has led to export-led manufacturing growth. It is expected that Bangladesh would continue to pursue export-led manufacturing growth relying on the implementation of favourable trade policies. But the export basket has been severely one-dimensional, heavily dependent on the apparel sector and has been continuously becoming less diverse. Lastly, without higher income and improved output quality and quantity, long-term economic growth cannot be achieved. In order for the economy to create goods and services at an efficient level, it is crucial to meet the technology and skill requirements of the manufacturing process. However, establishing a workforce with the necessary skills is a difficult challenge. Total Factor Productivity (TFP) is a well-known tool for predicting long-term economic expansion. According to the paper, improvements in TFP show improvement in industrial production efficiencies. The paper also analyses the skill gap in the labour market, showing that there is a notable imbalance between the supply of and demand for the labour force in the market.

For Bangladesh to achieve its vision of becoming an 'Upper middle-income country by 2031', a revamped focus is required in generating the necessary strategies for several sectors of the economy. Firstly, it is important to have an action plan and proper training for addressing the skill gap and the lack of use of technology in the economy. By enhancing the calibre of the internet services, fiscal policies that are ICT-friendly should be prioritized. The disadvantaged population and underdeveloped areas need to receive special attention. The secondary and higher secondary ICT courses must be taught properly with guaranteed practical classes. The technical training centres' training programs need to be improved, and the training resources need to be expanded. Additionally, specialized government programs are required to grasp the COVID-19 situation by educating people about the advantages of technology and providing them with training to combat the social stigma.

Secondly, Bangladesh economy has benefited greatly from the creation of garment-related jobs. However, Bangladesh's garment sector is currently at a turning point. Concerns have been raised about compliance issues and workplace safety in Bangladesh's garment industry, and in recent years, these concerns have become crucial for the industry's future. These worries ought to be positively handled as a chance to enhance the reputation of the industry on the world market. In this context, it is important to address issues such as pay, workplace safety, fringe benefits, workplace atmosphere, etc. in a priority manner. Enhancing worker productivity, upgrading to higher value-added products by introducing new technologies along the manufacturing line to drive innovation, and boosting Bangladesh's competitiveness by lowering the cost of doing business are also urgently needed.

Thirdly, Bangladesh still has a relatively low rate of female labour force participation. Evidence indicates that having more women in the workforce decreases the risk of having poor households and having more resources available to the female population has a variety of positive effects. Increased female labour force participation can be greatly aided by education, skill development, public and private sector initiatives to engage in the care economy, as well as various social security programs.

Lastly, a well-thought-out and successful industrial policy are required, focusing on financial incentives to develop the dynamic sectors. In order to support greater capacity for economic diversification, attracting FDI, and integrating with the global value chain, the industrial policy also needs to address issues of education and skill development. A crucial component of comprehensive policy improvements should be institutional reforms. These institutional changes include enhancing the quality of the bureaucracy, protecting property rights, controlling corruption, and assuring contract viability by lowering the chance of contract modification or cancellation. Additionally, it is crucial to promote political stability, lessen political turbulence, and build political capital in order to diversify the economy.

As Bangladesh is still in the recovery phase from the pandemic, the government will see a much quicker recovery if they adopt the following strategies, increase government spending for creating more jobs and discouraging spending on luxury goods and services, lower the interest rate to encourage the competitiveness between foreign and local businesses, expand the social safety net programs coverages for the extremely poor, unemployed people, and informal workers. The government can also increase the money supply in the financial market. In addition, the Economic Zones (EZs) need proper promotion by the government to ensure increased investments from both local and foreign investors. Also, Bangladesh needs a solid focus on mitigating the repercussions faced by natural disasters and climate changes.

Annex 1: Different Types of Recoveries[4]

The Coronavirus crisis stands to go down in history as an unwelcome sequel to the Great Depression, with its economic destruction ready to dwarf that of 2008's Great Recession. But even the worst of times won't last forever, and economists are now weighing in on how a recovery will look.

You might've noticed a lot of letters being tossed out: U, V, W, etc. In a recent poll from Reuters, which surveyed 45 economists throughout Europe and the United States, nearly half responded that the U.S. recovery would likely be "U-shaped," which was the largest percentage for any given shape. This represents a shift from prior weeks, when predictions for a "V-shaped" recovery were making the rounds.

V-SHAPED: A V-shaped recovery is marked by a steep, dramatic decline in the economy (the first half of the "V"), followed by an equally rapid upturn, mirroring the preceding drop in speed and intensity (the second half of the "V"). This is the best-case scenario, constituting a strong recovery. While analysts were hoping for the V shape to shape up, it's looking less likely as virus-related lockdowns continue and our economy rests in the pits.

U-SHAPED: The current front-runner, a U-shaped recovery means that after our economy falls off a cliff, it'll hang out at rock bottom for a while, potentially up to two years, and then eventually climb back to normal—as we saw with the Great Recession of 2008. With a U-shaped recovery, we can expect economic hardship to persist until at least late 2020 and likely into 2021, but we can take comfort in the fact that an upswing will come.

W-SHAPED: Also known as a "double-dip" recession, this is exactly what it looks like—a V-shaped recession and recovery, followed by another V-shaped recession and recovery. This might occur if, say, we relaxed Coronavirus containment measures prematurely, saw an improvement in the economy, and then fell victim to another Coronavirus outbreak. Given the reports that some COVID-19 survivors have been retesting positive for the virus, and speculation that cold weather could increase the virus's contagiousness, a W-shaped scenario is not far-fetched.

L-SHAPED: This is the worst-case scenario, in which the economy sinks and then stays on the ocean floor for a prolonged period of time—who knows how long, but it could be up to 10 years—and then either does or doesn't return to its former state. In 1990, Japan experienced an L-shaped recession, which has since been dubbed its "lost decade." We might end up here if we never find a way to control the Coronavirus outbreak, but fortunately, most experts think this is unlikely.

Note: None of these are official terms. And some financial analysts have drawn their own unusual shapes, such as:

NIKE-SWOOSH-SHAPED: A riff on the U shape, the swoosh was described by Bloomberg as a situation in which spending slowly resumes, with economic limits eased much more gradually than they were imposed. This would mean "the level of economic output stays beneath the level of its pre-crisis trend well into 2021 and there's a lack of animal spirits as people remain cautious of over-spending or taking long-distance trips, especially if they have to deal with debts," Bloomberg explained.

INVERTED-SQUARE-ROOT-SHAPED: This term, coined by George Soros in 2009, refers to a recession in which "you hit bottom and you automatically rebound some, but then you don't come out of it in a V-shape recovery or anything like that. You settle down—step down." Let's hope we don't see this happen.

J-SHAPED: Described by TheStreet as "strictly for optimists," this is when the economy rebounds far beyond pre-recession levels. Fingers crossed for a J shape—after all, any U shape can become a J shape over time.

Annex 2: Specification of Delta Scenario (Low Policy Scenario)

[4] https://www.fastcompany.com/90494041/u-shaped-or-v-shaped-recovery-heres-your-guide-to-the-geometry-of-recessions.

- In order to specify the Delta scenarios, Bangladesh was divided into 7 regions according to 8 climate and environmental risks.

Region	Environmental Risks							
	Cyclone	Flood	River Bank Erosion	Sea level Rise	Drought	Salinity intrusion	Siltation in Water ways	Water shortage
Haor	L	M	M				M	
Coastal	VH	H	M	H		VH	M	
River Estuary	H	VH	VH			M	H	
Drought	L	L	L		H		L	
Chittagong Hill Tract	L	L	L				L	H
Urban	M	M	M	M		H	M	VH
Less Disaster-Prone Region	L	M	H				M	M

- Numerical specifications of the 8 environmental risks by 7 regions are based on available data and researches.

Hotspots	Cyclone[1]	Flood[2]	River Erosion and Sea level Rise[*3]	Salinity[4]	Drought[5]	Siltation in water-ways[6]	Water shortage[7]
	% of loss	% of loss	% decrease in net cultivable area	% of loss in annual income	% decrease in net cultivable area	Distribution of loss in total loss of .20% of GDP	Distribution of loss in total loss of .05% of GDP
Haor and flash flood areas	5	10	0.30	0.0	0.0	10	0
Coastal Zone	45	20	0.50	0.30	0.0	20	0
River Systems and Estuaries	25	40	0.60	0.20	0.0	34	0
Barind and Drought Prone Areas	5	10	0.0	0.0	0.25	15	0
CHT	3	2.5	0.01	0.0	0.0	1	1
Urban Areas	12	10	0.10	0.05	0.0	10	90
Less Disaster Prone Region	5	7.5	0.30	0.0	0.0	10	10

**Sea level rise is only for coastal zone*

Source: BDP 2100 Technical Team Analyses, GED, 2015

1. This framework takes the estimates of 'Cyclones in a Changing Climate: The Case of Bangladesh' (Dasgupta et al, 2011) to forecast the losses incurred due to Cyclone from 2016 to 2041. From their estimation of losses and damages where, damages refer to the potential complete or partial destruction inflicted on assets and losses refer to the potential flow of goods and services not provided and increased costs of continuing essential services, amount of losses (after adjusting them for 2005 prices) are taken into account as it is assumed that real GDP would be decreased by the amount of loss. To forecast the loss, it is assumed that loss increases at a rate of ten percent each year without any adaptive/mitigating measures.
2. To forecast the losses from floods till 2041, this framework takes into account the loss incurred in the past, modified from Choudhury et al (2003). In a fifty-year period, the total reported loss from flooding was estimated to be Tk. 492 billion. To forecast for the period from 2016 to 2041, it is assumed that a total of Tk. 680.3 billion at constant prices loss would be incurred and it is assumed that it would increase at the rate of ten percent each year to accommodate increase in the intensity of lose as income increases. And this loss

also includes the loss due to increase in rainfall, a consequence of global warming, and decrease in trans-boundary water flow.

3. To forecast the effect, this model assumes different percent of land loss across the region, according to their degrees of vulnerability, because of river erosion and sea level rise (only in coastal zone).
4. To forecast the intrusion of salinity, this model takes the forecast of Dasgupta et al (2014). They estimated that the income of Barisal Division would be decreased by a total of 10.5% in the period 2012-2050, which is the highest. Using their estimate, in this model it is assumed that in the coastal zone the loss would be 0.3% of income annually. It is also assumed the annual loss in river systems and estuaries and urban areas would be 0.2% and 0.05% of income, respectively.
5. Because of unavailability of the impact of drought in Bangladesh, this model takes the assumption of 0.25% of cultivable land is lost due to drought in drought prone areas.
6. It is assumed that siltation in water-ways would account for a total of 0.20% decrease in GDP.
7. It is assumed that water shortage would account for a total of 0.05% decrease in GDP.

Annex 3: Summary of Growth, Poverty and Fiscal Response

The UN (2021)[5] report on 'World Economic Situation and Prospects' painted a rather gloomy economic situation for 2020. All 18 regional economic blocks used in the report posted negative GDP growth rates in 2020, albeit with substantial variations. Global GDP decline has been estimated at 4.3 per cent in 2020—the sharpest contraction of income since the Great Depression. The decline is more than double the GDP contraction of 1.7 per cent reported for the Great Recession in 2009.

Table 11. GDP in selected regional economic blocks (percentage change)

Regions	2019	2020	2021	2022
SAARC	4.5	-8.0	7.1	5.5
EU-27	1.5	-7.4	4.8	2.7
SIDS	1.5	-6.8	4.7	3.0
MERCOSUR	0.5	-6.5	3.6	2.3
OECD	1.7	-5.5	4.0	2.6
G7	1.6	-5.5	4.0	2.5
GCC	0.6	-5.4	3.5	2.5
SADC	0.8	-5.1	2.8	2.8
World	2.5	-4.3	4.7	3.4
G20	2.6	-4.1	4.8	3.4
ASEAN	4.3	-3.7	5.6	4.7
CIS	2.2	-3.4	3.4	3.0
ECCAS	0.8	-3.3	2.3	3.2
ECOWAS	3.3	-2.7	2.5	3.7
LLDC	4.3	-2.4	4.1	4.4
G77	4.0	-2.2	6.1	4.9
LDC	4.8	-1.3	4.9	4.6
BRICS	5.1	-0.5	6.5	5.3
EAC	6.4	-0.3	3.2	4.1

Abbreviations: ASEAN, Association of Southeast Asian Nations; BRICS, Brazil, Russian Federation, India, China and South Africa; CIS, Commonwealth of Independent States; EAC, East African Community; ECCAS, Economic Community of Central African States; ECOWAS, Economic Community of West African States; EU, European Union; G7, Group of Seven; G20, Group of Twenty; GCC, Cooperation Council for the Arab States of the Gulf; MERCOSUR, Southern Common Market (Mercado Común del Sur); OECD, Organization for Economic Cooperation and Development; SAARC, South Asian Association for Regional Cooperation; SADC, Southern African Development Community; SIDS, small island developing States.

Source: UN DESA, based on projections and scenarios generated by the World Economic Forecasting Model (WEFM).

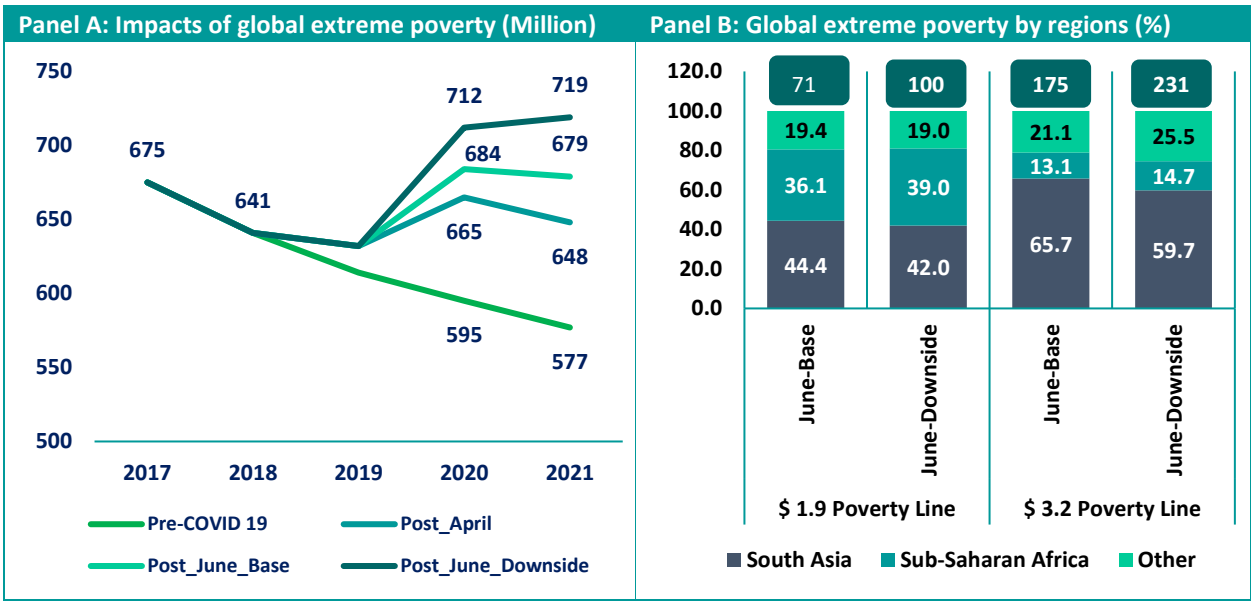
Despite impressive progress during the last few decades, poverty has been still pervasive (mainly in South Asia and in Sub-Saharan Africa). The impressive gains on the poverty front are under threat due to large income loss and rise in unemployment rate associated with COVID-19. While commenting on the poverty situation in South Asia and Sub-Saharan Africa, World Bank (2020), suggested that gains in poverty reduction may be lost by only one event – COVID-19. Furthermore, World Bank (June 8, 2020) simulations

[5] UN (2021), "World Economic Situation and Prospects", United Nations, New York, 2021

on the extreme poverty situation portrayed a rather gloomy scenario for South Asia and Sub-Saharan Africa. In June 2020, World Bank (WB) updated the April poverty estimates using the new GDP growth forecasts. The extreme poverty estimates are provided in figure below.

The new growth forecasts contain two scenarios—baseline and downside—allowing WB to explore two different scenarios to assess the impact on poverty. The descriptions of these two scenarios are that 'the baseline scenario assumes that the outbreak remains at levels currently expected and that activity recovers later this year, while the downside scenario assumes that outbreaks persist longer than expected, forcing lockdown measures to be maintained or reintroduced. Should the downside scenario materialize, vulnerable firms would exit markets, vulnerable households would sharply reduce consumption, and several low- and middle-income countries would see heightened financial stress. The baseline scenario has global growth contracting by about 5 per cent in 2020 while the downside scenario presents a global growth contraction of 8 per cent in 2020.'[6]

Figure 11: Global Poverty during COVID-19



Note: Dark Green boxes in Panel B refers to the number of extreme poor persons in million.
Source: Based on World Bank (June 8, 2020).

- According to the baseline scenario measured at the international poverty line of $1.90 per day – due to COVID-19, 71 million global citizens would fall into extreme poverty. Extreme poverty increased to 100 million under the downside scenario. Under both scenarios – the hardest affected regions are South Asia and Sub-Sharan Africa accounting for more than 42 per cent and 35 per cent of the new extreme poor persons.
- At a higher poverty line such as $3.20 poverty line per day, the regional distribution of the additional extreme poor persons changed dramatically. With the same growth projections, the use of a higher

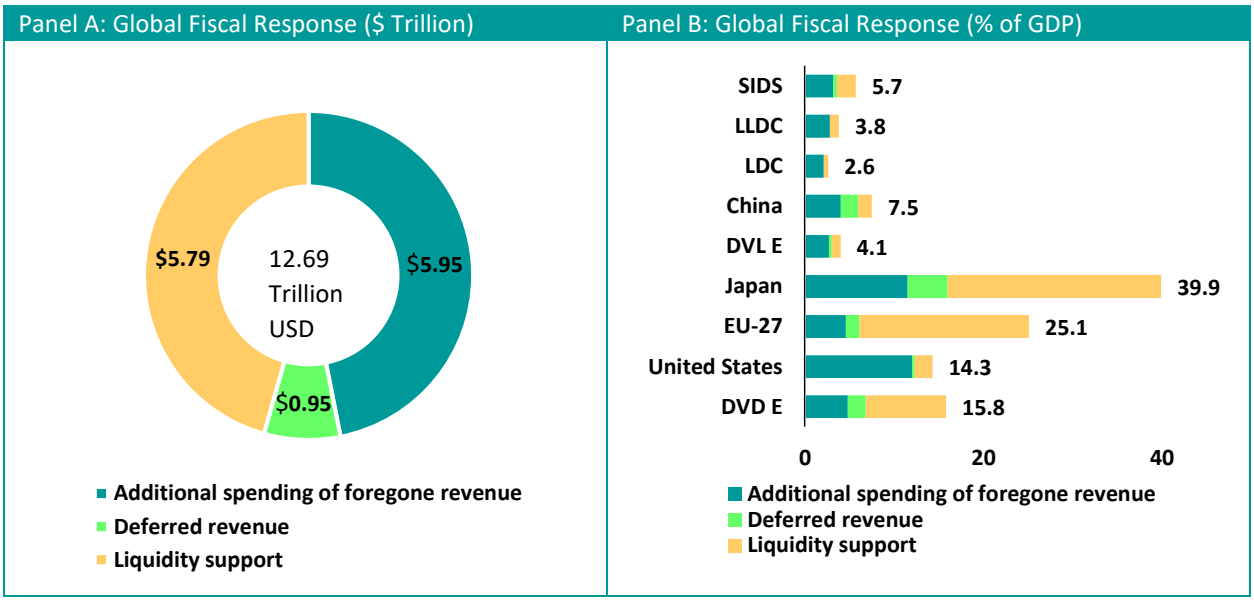
[6] https://blogs.worldbank.org/opendata/updated-estimates-impact-covid-19-global-poverty

poverty line may see the number of total extreme poor jump to 175 million under the base scenario and 231 million under the downside scenario. Out of the 175 million people new extreme poor people, South Asia would account two-thirds of them while the estimated share for Sub-Saharan Africa is 13 per cent.

Global Fiscal Response:

The Global response to COVID-19 shocks to save lives and livelihoods has also been extraordinary. Almost all countries proposed large stimulus packages to address the COVID-19 shocks. To combat the massive COVID-19 shocks, global fiscal response has been unprecedented. The global fiscal response amounts to $12.7 trillion, including $5.9 trillion for additional spending and $5.8 trillion in liquidity support (see below). At 15.8 per cent of world gross output in 2020, this is the largest fiscal response since the Second World War (UN, 2021).

Figure 12. Global Fiscal Response



Note: Fiscal response as a share of GDP represents unweighted averages for the countries and country groups. EU-27: European Union; SIDS: Small Island Developing States, LLDC: Landlocked Developing Countries, LDC: Least Developing Countries; DVL E: Developing Economies; and DVD E: Developed Economies.

Source: IMF Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic, available at https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19.

SUMMARY REPORT OF TEN SECTORS

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Abbreviations and Acronyms

BBS	: Bangladesh Bureau of Statistics
NEP	: National Education Policy
NSDP	: National Skill Development Policy
SEIP	: Employment Investment Program
ADB	: Asian Development Bank
NSDP	: National Skills Development Policy
SDC	: Swiss Agency for Development and Cooperation
SDCMU	: Skills Development Coordination and Monitoring Unit
BIDS	: Bangladesh Institute of Development Studies
ICT	: Information and Telecommunication
TVET	: Technical and Vocational Education and Training
LFS	: Labour Force Survey
RMG	: Readymade Garments
APO	: Asian Productivity Organization
SMI	: Survey of Manufacturing Industries
BBS	: Bangladesh Bureau of Statistics
WBES	: World Bank-Bangladesh Enterprise Survey
STEP	: The World Bank's Skills Toward Employment and Productivity Survey
SWTS	: The ILO's School to Work Transition Survey
ESJS	: European Skills and Jobs Survey
BSCO	: Bangladesh Standard Codes for Occupation
SWAp	: Sector Wide Approach
SDGs	: Sustainable Development Goals
CAD	: Computer Aided Design
CAM	: Computer Aided Manufacturing
BASIS	: Bangladesh Association of Software and Information Services
MCA	: Masters in Computer Application
UGC	: University Grants Commission
R&D	: research and Development
ANU	: Active Network Unit (ANU)
DC	: Deputy Commissioner
IoT	: Internet of Things
CCU	: Critical Care Unit
ICU	: Intensive Care Unit

1. INTRODUCTION

1.1 Background

Bangladesh has made a remarkable success in achieving a steady growth over the last few decades, with about a one percent increase in every decade since the 1980s. Average real GDP growth over the last five years has been above 6.5 percent, which is much higher than the average growth rate of all developing countries (4.7 percent). Recently, in the beginning of FY2015-16 per capita income of Bangladesh has crossed the threshold of USD 1,046 to become a lower-middle-income country. According to the Bangladesh Bureau of Statistics (BBS), per capita income is estimated at US$ $1,751 in FY2017-18. The economy now aspires to attain the high middle-income status by 2030 and developed country status by 2041. To this end, in addition to factor accumulation (capital and labor), the economy requires upgrading skills of the workforce to enhance productivity.

It is argued that the productivity in the production process has been very low in Bangladesh. Almost 99 percent of the growth has been contributed by the accumulation of factors. The risk of growth relying solely on factor accumulation is that at one stage the diminishing marginal return of factors set in, which ultimately leads to a stagnation of growth. Though Bangladesh may be away from reaching the point of diminishing return, the country should consider improving the productivity of the labor force to maintain the high growth now and also to avoid the 'middle-income trap' in future.

The low level of skills and productivity of the Bangladeshi labor is endemic, as indicated by labor force survey data that more than 60% of the labor force has either no education (40%) or only up to primary level (23%). With the approval of the National Education Policy (NEP), 2010 and the National Skill Development Policy (NSDP), 2011, the government embarked on major education and training reforms. In 2014 the government of Bangladesh has initiated the Skills for Employment Investment Program (SEIP), a multi-tranche financing facility supported by the Asian Development Bank (ADB) and the Swiss Agency for Development and Cooperation (SDC), anchored in the National Skills Development Policy (NSDP), 2011. A total of 550,000 trainees have been trained and certified since the commencement of SEIP training with a job placement rate of nearly 70 percent. Female participation among trainees is more than 30 percent.

Against this backdrop, SDCMU of Ministry of Finance has requested BIDS to conduct a study of the labor market for Skill for Employment Investment Project (SEIP).

1.2 Objective of the Study

I. The main objective of assignment is to analyze labor supply and demand over the next 10-year period (2020-2030) in order to assist the government and the private industry to better plan the capacity and quality of skills training systems according to the evolving skills/trade/market demands from rapidly growing industry sectors.

II. The second objective of the assignment is to determine sector priorities, assess skills gap by sector, analyze sector-wise occupational composition of employment (including gender

composition of employment), assess occupation-wise training requirement by sector and trade.

1.3 Scope of this report

In order to operationalize the above objectives, the scope of the study was divided into five components.

I. Macro framework

II. 10 specified sectors: Sector-representative and skill-focused enterprise and worker surveys (Agro-food industry, electronics, construction, light engineering, ICT, RMG, hotel and tourism, shipbuilding, leather and footwear, and nursing)

III. Identification of priority sectors (beyond the specified ten sectors)

IV. Stock taking of technical and vocational education and training (TVET) institutions

V. Assessment of skill demand in the international market

These five components produced 14 reports - 10 reports on individual sector (component 2) and 4 reports on the rest four components.

This summary report has a selective focus with practical uses. The report does not dare to summarize all the 14 reports that have been produced under the study, rather pick a few issues that might have interest to broader audiences such as academicians and practitioners. While the individual reports are stand-alone ones, a comparative summary of the ten sectors of component 2 has been documented in terms of a set of stylized facts. These facts will be useful for the practitioners for designing future skill development projects as well as for the academicians for conceptualizing the issues related skill mismatches and finding the appropriate solutions. Since projection of occupation-wise demand in near future is of critical importance to the policy makers, we also compile them from each individual reports. This summary report also dwells on detailed recommendations, both in general and sector specific.

2. CONTEXT: THE MACRO VIEW ON LEVE OF SKILL OF LABOR FORCE

2.1 Employment of selected 10 subsectors

In order to put 10 sectors into context, we first document the macro trends of the employment of these sectors.

Table 1 Employment of selected 10 sectors

Sub Sector	2013			2016-17		
	Male	Female	Total	Male	Female	Total
Agro processing	1.58	3.44	2.11	1.3	0.87	**1.17**
Health Care	1.68	2.85	2.01	1.03	1.33	**1.12**
Hospitality and Tourism	0.04	0.05	0.05	0.064	0.11	**0.078**
RMG and Textile	4.92	13.86	7.47	6.2	11.34	**7.78**
Constructions	5.34	1.23	4.16	7.54	1.37	**5.65**
Leather	0.19	0.13	0.18	0.25	0.18	**0.23**
Light Engineering	0.78	0.36	0.66	0.95	0.19	**0.72**
IT	0.37	0.15	0.31	0.36	0.081	**0.28**
Shipbuilding	0.1	0.04	0.08	0.086	0.0056	**0.061**
Electronics	0.5	0.26	0.43	0.42	0.17	**0.34**
All Other	84.5	77.64	82.54	81.78	84.36	**82.58**
Total	**100**	**100**	**100**	**100**	**100**	**100**

Sources: Labor Force Surveys 2013, 2016-17

Table 1 shows that the selected 10 sectors account for about 17.5 percent of total employment in both 2013 and 2016-17. Among these subsectors, RMG and textiles constitute about 7.5-8 percent of total labor force in 2013-2017. The construction sector has seen an increase in share of employment, from 4.16 percent in 2013 to 5.65 in 2016-17. The share of employment in the subsectors such as agro-processing, health care, IT has not been changed over time. Leather and light engineering subsectors went through an increase in the share of employment.

The following Table 2 shows the share of employment of the selected 10 subsectors in total manufacturing and service sectors. Note that among the 10 subsectors, 7 subsectors belong to manufacturing sector and 3 are of service sector. These 7 manufacturing subsectors make up about 86 percent of manufacturing employment while 3 service subsectors represent about 7 percent of employment in service sector.

Table 2 Employment share in total manufacturing and service

Manufacturing Sector			Service Sector		
Subsector	2013	2016	Subsector	2013	2016
Agro processing	11.96	4.39	Healthcare	9.78	5.17
RMG & Textile	50.84	75.51	Hospitality and Tourism	0.24	0.49
Leather and Footwear	1.56	1.24	IT	1.62	1.71
Light Engineering and electronics	3.73	2.68	All Other Service Sector	88.35	92.64

Manufacturing Sector			Service Sector		
Shipbuilding	0.46	0.23	Total Service Sector	100	100
Electronics	5.85	1.57			
Other Manufacturing Sectors	25.6	14.38			
Total Manufacturing Sector	100	100			

Source: Calculated from LFS 2013 and LFS 2016-17

2.2 Labor force with training

Table 3 shows the share of workers who received training in previous 12 months by broad sectors. Although, employment shares of education and health sector and skilled service are low, share of trained workers in the last 12 months in these sectors are higher than other subsectors. In the case of industry sector, share of recently trained worker is alarmingly low, only 1.33 percent. While construction sector is a major driver of economic growth, only 0.45 percent has received any training in previous 12 months. Interestingly the share of trained workers is much lower among men compared to women in sectors such as skilled service, education and health and electricity, gas, steam and air conditioning supply. We observe the opposite case for manufacturing and construction sector.

Table 3 Share of workers with training by broad sectors (received any training in last 12 months)

Sectors	Male	Female	Total
Agriculture, forestry and fishing	0.36	0.37	0.37
Mining and quarrying	0.26	0	0.25
Manufacturing	1.76	0.45	1.33
Electricity, gas, steam and air conditioning supply	6.04	14.9	6.8
Water supply, sewerage waste management and remediation	4.52	6.49	5.21
Construction	0.48	0.19	0.45
Wholesale and retail trade, repair trade, repair of motor vehicles	0.92	0.92	0.92
Transportation and storage	0.44	1.06	0.47
Accommodation and food service activities	0.49	0.15	0.43
Skilled Service	5.97	10.67	6.56
Education and Health	8.47	12.23	10.03
Other Sectors	4.53	2.64	3.65

Source: Calculated from LFS 2016-17

2.3 Training in selected 10 sectors

Table 4 presents the share of workers who received any training for the selected 10 subsectors during the previous 12 months. Healthcare constitutes largest share of recently trained workers followed by the IT subsector. It is interesting to observe that the subsectors RMG and textiles and healthcare where share of women's employment is high, the trained worker's share is much lower among women compared to men.

Table 4 Share of workers with training in 10 subsectors (Received training in last 12 months)

Subsector	Male	Female	Total
Agro processing	2.17	0.39	1.76
Health Care	12.55	10.84	11.93
Hospitality and Tourism	4.42	0	2.5
RMG and Textile	1.47	0.39	0.99
Constructions	0.48	0.19	0.45

Subsector	Male	Female	Total
Leather	1.01	0.97	1
Light Engineering	1.73	2.36	1.78
IT	10.73	21.77	11.73
Shipbuilding	0.63	0	0.62
Electronics	5	6.15	5.17
Total	1.29	1.48	1.35

Source: Calculated from LFS 2016-17

At the end, we report a comparative picture on manufacturing labor productivity of the Asian countries from Asian Productivity Organization (APO). The figure shows that the productivity of labor in the manufacturing sector in Bangladesh is abysmally low – the country is behind India but above Pakistan.

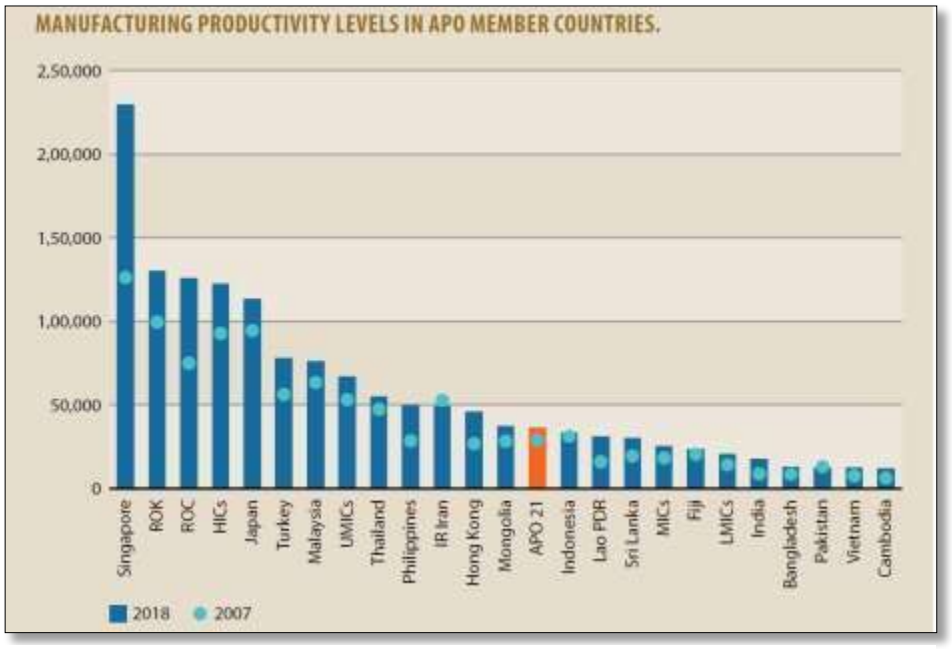


Figure 1 Manufacturing labor productivity in Asian countries

Source: Asian Productivity Organization (APO) Outlook 2022

3. CONCEPTUAL ISSUES

This brief concept note will help sharpen our understanding of various issues, forms and measurements of skill mismatches which are used in this report.

3.1 Soft vs. Hard skill

Soft skill includes non-cognitive abilities or personality traits such as teamwork, communication, work ethic, time management, work under pressure, etc. As there is increasing evidence on the high return of soft skills, we also consider soft skills in this study.

3.2 Skill Mismatch

Skill mismatch refers to various types of imbalances between skills offered and skills needed in the labor market. The broad concept of skill mismatch can assume different forms, such as vertical mismatch (over-education and under-education), horizontal mismatch (field of study), skill gaps, skill shortages and skill obsolescence. Skill mismatch, in all of its forms, is a major source of labor underutilization. For example, if workers in a firm are overeducated than is required for the particular job they are working in, this means that the firm is wasting a part of labor productivity which, if skill had matched perfectly, could have been used to generate a higher level of output. Similarly, under-education means that the firm is not operating at its full potential, losing a part of the output that could have been gained in the absence of the mismatch. All labor market actors, e.g. the government, corporations and workers need to ensure that the appropriate skill gets employed at the appropriate job to shape labor market outcomes which leads to higher growth, productivity and competitiveness (ILO 2014). In developing countries, the first-order problem is skill shortage and skill gap – there are not enough skilled workers available and if available they do not possess the required level of skill. In the following sections, we will briefly discuss various forms of skill mismatches and how to measure them.

3.3 Forms of Skill Mismatch

Skill Gap

Skill Gap is a firm-level measure of skill mismatch based on the employer's perception about the ability of employees. It measures the degree to which workers lack adequate competencies to successfully perform their current duties at the job. This type of skill gap may cause lower output, increase labor cost, incur additional cost on training and adversely affect firm-level profitability.

Skill Shortage

Skill Shortage refers to a situation where employers cannot find suitable candidates with certain skills to fill job vacancies. Situations like this are characterized by market conditions where the demand for skills by employers cannot be met by the available supply at the equilibrium wage rates. An important feature of this firm-level measure is that it is directly linked with the skill gap; whenever firms find it hard to fill vacancies due to lack of a particular skill group, they are forced to recruit inadequately skilled workers into those positions.

Over-education and Under-education

Measured at the level of individual's circumstances, over-education and under-education refer to the degree to which workers' education levels are above, below or poorly matched to those required for their current jobs. In case of job vacancies, the measure relates to the

degree to which applicants' education levels meet the hiring requirements. This is also known as a vertical mismatch.

Horizontal Mismatch

Horizontal Mismatch refers to situations where workers get employed in jobs that are neither related to their education, nor their skills and knowledge. The measure identifies any mismatch between the workers' primary field of study and the skill required for their current jobs.

4. METHODOLOGY

All the reports use both quantitative and qualitative approaches to address the research objectives. While the quantitative approach dominates with primary data collection through structured questionnaires, individual reports also rely on FGDs and KIIs to collect information which the structured questionnaires cannot do. In fact, all sectors submitted separate reports on the findings from FGDs and KIIs.

4.1 Sampling Strategy and Sample Size

Following World Bank-Bangladesh Enterprise Survey (WBES) 2013 method, we estimated the sample size and conduct the survey. Once the total sample is selected, we will stratify them in size and geographical concentration. We took the help of the local business associations to locate the enterprises.

The sampling formula of the World Bank's Enterprise Survey is given by-

$$n = \left[\frac{1}{N} \cdot \left(\frac{N-1}{N} \cdot \frac{1}{PQ} \cdot z^2_{1-\alpha/2}\right) \cdot \left(1 + \frac{1-PQ}{PQ} \cdot k\right)\right]^{-1}$$

where n= sample size, N=population size, P=population proportion, Q=1-P, k=desired level of precision, confidence, 1-α. Following WBES, we assume k = 7.5%, α=10%, and P=0.5 for all sectors.

Table 5 Distribution of sample across sectors

Study	Sample size (enterprises)	Sample size (workers)
RMG	119	476
ICT	150	292
Construction	108	306
Light Engineering	121	1522
Electronics	100	1340
Ship-building	60	867
Leather and footwear	93	902
Agro-food processing	117	547
Tourism and hospitality	220	766
Nursing	50	-
Total	**1138**	**7018**

4.2 Questionnaire Design

Two standardized questionnaires are used – one for enterprise and the other for employees. We closely followed the structure of the questionnaire of Survey of Manufacturing Industries (SMI) of BBS and World Bank-Bangladesh Enterprise Survey (WBES) 2013 for the basic variables of enterprises such as output, inputs (land, labor, capital, and raw materials), technology, financing, and markets (input and output). We will have separate modules to capture different forms of skill

mismatch discussed above. We particularly took the help of the following surveys conducted in other countries, for both enterprises and employees.

- The World Bank's Skills Toward Employment and Productivity Survey (STEP)
- The ILO's School to Work Transition Survey (SWTS)
- Cedefop's European Skills and Jobs Survey (ESJS)
- OECD's Survey of Adult Skills (PIAAC)
- Reflex Project

5. FINDINGS ON SKILL MISMATCH

As discussed before, there are four types of skill mismatches – skill gap, skill shortage, vertical and horizontal mismatches. This section will present the findings on skill mismatch. Reporting findings of individual sector separately will be monotonous and not intellectually appealing and hence we summarize the results in such a way that we can generalize the results by comparing the sectors.

5.1 SKILL GAP

STYLIZED FACT 1: Skill gap increases with the level of technological sophistication of the sectors.

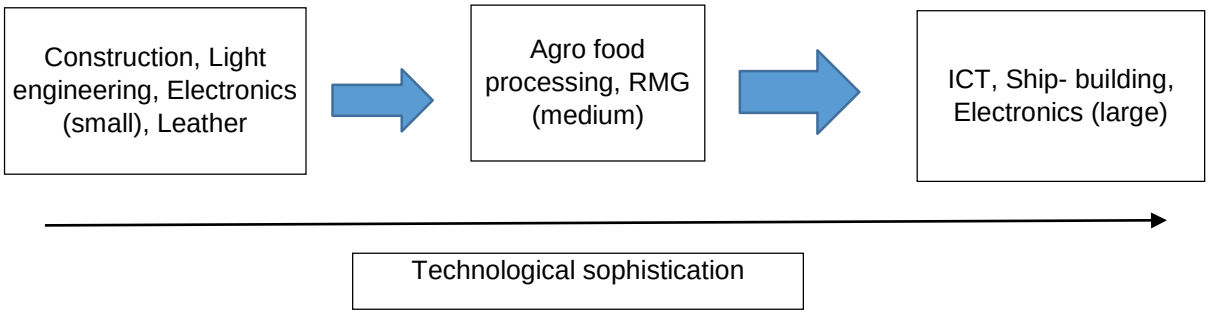


Figure 2 Flow chart of technological sophistication of sectors

We first categorize the sectors in terms of technological sophistication. Largely we consider the capital-labor ratio and our conversations with the sector experts. We categorize them into three groups – low level, medium level and high level. Construction, light engineering, electronics and leather sectors belong to the low technology group, agro food processing and RMG are medium technology group and ICT, shipbuilding and electronics (large) are in the low group. Note that electronics is a highly heterogeneous sector and hence we divide them into small and large firms. The large firms include firms like Walton, RFL, etc.

With these categories, we find that the skill gap tends to increase with the level of technological sophistication of the sectors. That is, according to the employers' perception, deficiency in proficiency of performing any particular tasks is higher for the technologically sophisticated sectors like ICT or large electronics firms. We provide examples from sectors below; but before that we want to introduce another stylized fact so that we can discuss these two facts together as they are closely related.

STYLIZED FACT 2: Skill gap higher for the professionals and technical persons

In order to generalize our results, individual categorize occupations according to Bangladesh Standard Codes for Occupation (BSCO) at digit one level. We use five broad categories - managers, professionals, technicians, sales and clerks, craftsmen and plant workers. However, may sectors have used 3 and 4 digit level occupations for their own purposes and convenience. Stylized fact 2 notes that the skill gap is higher for the professionals and technicians. That is, the employers do not get the desired level of proficiency in the professional and technical jobs. This

may also reflect that it is the technology related jobs where lack of proficiency is revealed more than managerial jobs.

Table 6 Skill gaps by technological sophistication of sectors

Designation	Low level of technological sophistication (construction sector)		Medium level of technological sophistication (light engineering sector)		High level of technological sophistication (Electronics sector (large)	
	Level of proficiency (1-10 scale)	Skill gap (10 minus level of proficiency)	Level of proficiency (1-10 scale)	Skill gap (10 minus level of proficiency)	Level of proficiency (1-10 scale)	Skill gap (10 minus level of proficiency)
Manager	9	1	7.84	2.16	7.07	2.93
Professionals	8	2	7.00	3	6.98	3.02
Technician	8.75	1.25	7.85	2.15	7.00	3.00
Sales and clerk			7.28	2.72	7.62	2.38
Crafts and plant workers	9	1	6.64	3.36	6.16	3.84
Total	**8.54**	**1.46**	**6.94**	**3.06**	**6.45**	**3.55**

We select three sectors – construction, light engineering and large electronics - each from technological sophistication group defined above. In the case of low tech construction sector, skill gap is about 14.6 percent compared to the desired level of the employers. This figure is about 30 percent for light engineering sector, a sector from middle group. Lastly, in large electronics sector, skill gap has been found to be 35.5 percent. These three sectors indicate that skill gaps tend to grow with technological sophistication of the sectors.

Table 6 also sheds light on the stylized fact 2. Consider light engineering and electronics sectors, for example. In the case of light engineering, skill gap is 30 percent for professionals and 33.6 percent for craft and plant workers which are well above other occupations. Similarly, in large electronics sector, skill gaps are higher for professionals and crafts and plant workers which are 30.2 and 38.4 percent respectively. This is also higher for technicians – 30 percent. Hence, within each sector, jobs related with technical skills are subject to higher skill gaps.

Both the stylized facts have implications for designing interventions for skill development. While the first fact indicates that greater focus is required for technologically sophisticated sectors, the second fact emphasized technology-related training.

Table 7 RMG sector: Share of workers with low, medium and high proficiencies

Occupation	Average Proficiency of Male			Average Proficiency of Female		
	Low	Moderate	High	Low	Moderate	High
Managers	0.69	19.58	79.72	0.56	5.56	93.89
Management Employees	3.40	25.28	71.32	4.10	21.46	74.44
Spreader Man	7.23	26.32	66.46	4.82	16.32	78.86

Occupation	Average Proficiency of Male			Average Proficiency of Female		
	Low	Moderate	High	Low	Moderate	High
Marker man	6.11	29.29	64.60	1.75	10.00	88.25
Cutter man/woman	4.92	28.94	66.14	0.83	7.20	91.97
Sticker man	7.87	26.39	65.74	6.39	15.90	77.70
Lock Stitch Machine Operator	10.18	30.52	59.30	12.46	29.78	57.76
Chain Stitch Machine Operator	9.19	26.70	64.11	11.13	26.23	62.64
Flat-lock Machine Operator	10.24	30.08	59.68	11.94	28.31	59.76
Over-lock Machine Operator	9.93	28.01	62.06	10.88	28.31	60.81
Button Hole Machine Operator	6.48	25.41	68.11	8.03	32.30	59.67
Printing Machine Operator	4.00	78.00	18.00	0.00	2.00	98.00
Embroidery Machine Operator	2.50	81.25	16.25	2.50	6.25	91.25
Quality Inspector/ End line Quality	6.60	25.56	67.85	7.64	24.72	67.64
Quality Controller/ In line Quality	4.50	28.42	67.08	4.33	17.00	78.67
Total	9.22	25.22	65.56	9.37	19.85	70.78

Table 7 reports the percentage of workers with low, medium and high proficiency levels for RMG sector. This table also shows that a higher share of workers with managerial jobs are proficient than the technical workers. The skill gap is lower for the white color managers as perceived by the employers.

The above table also indicates that there is a gender dimension of skill level or skill gaps. This leads to our third stylized fact, which is given below.

STYLIZED FACT 3: On average, female workers are more proficient than male workers in female dominant industries (e.g., RMG).

Table 7 as well as Figure 3 show that share of highly proficient workers is higher for the female than the males. Light toned bars are for knit industry and dark-toned bars are for the woven industry. There is not much difference between knit and woven as far as proficiency level is concerned. About 70 percent of the female workers belong to the high proficiency group while about 65 percent of male workers belong to this group. There are also occupation specific proficiency by the female workers – female workers are much better in operating printing machines or the embroidery machines (Table 7).

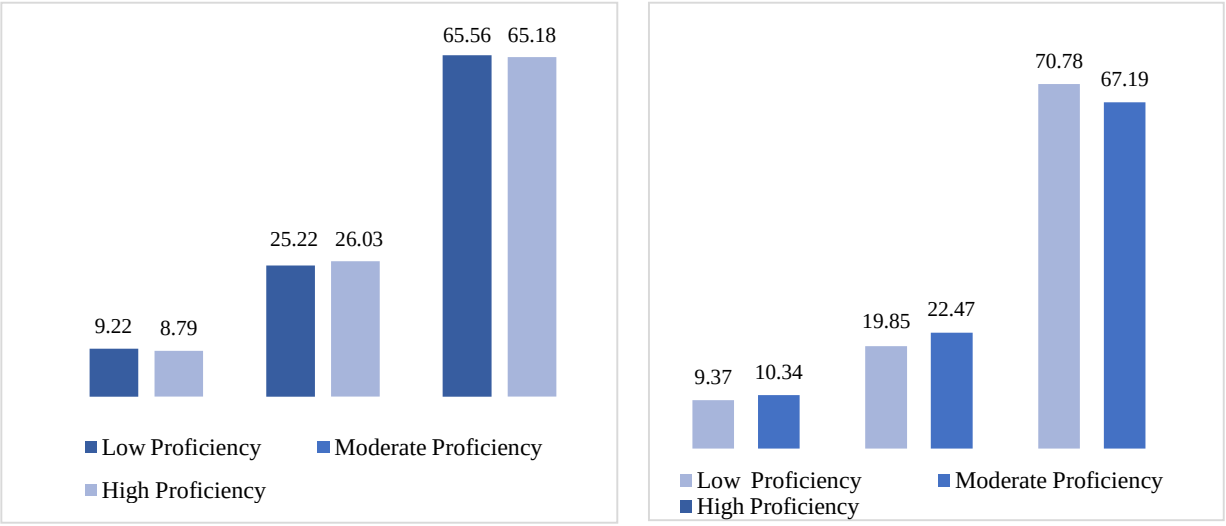


Figure 3 Level of proficiency of the workers by gender

STYLIZED FACT 4: Skill gap is higher for senior level technical positions

We use the example of the ICT sector to illustrate the point that substantial skill gaps exist at the senior level positions. In the case of software development, skill gap is high for 18 percent of the senior level positions whereas it is only 7 and 5 percent for mid and entry levels respectively. Moderate level gaps are also higher for the senior positions than the lower tiers. In the case of mobile application developer, 21 percent of the senior officials have high level of skill gaps, and this figure is 11 and 6 percent for mid and entry levels respectively. This is also true for programmers, data scientists and web developers.

Table 8 Skill gaps by seniority in occupations

Designation	Level	Rate overall skills gap (1 to 5: low to high), (% of Firms)				
		Very low	Low	Moderate	High	Very high
Software Developer	Entry-level	59	17	18	5	0
	Intermediate or Experienced	34	24	32	7	2
	Senior-level or Supervisor	18	25	38	18	2
Mobile App Developer	Entry-level	51	18	24	6	1
	Intermediate or Experienced	22	17	46	11	3
	Senior-level or Supervisor	2	30	43	21	4
Game Developer	Entry-level	15	38	46	0	0
	Intermediate or Experienced	6	38	25	25	6
	Senior-level or Supervisor	17	25	25	17	17
Applications developers/programmers	Entry-level	64	20	8	8	0
	Intermediate or Experienced	38	19	34	8	1
	Senior-level or Supervisor	15	28	38	18	1
Web Dev. & Graphic & multimedia designers	Entry-level	64	16	13	5	2
	Intermediate or Experienced	43	12	32	11	2
	Senior-level or Supervisor	22	28	33	16	1
	Intermediate or Experienced	30	23	33	11	3
	Senior-level or Supervisor	17	24	33	21	5
	Intermediate or Experienced	38	31	26	4	1
	Senior-level or Supervisor	18	29	37	15	1
Data Scientist	Entry-level	56	18	10	15	0
	Intermediate or Experienced	39	16	37	5	3
	Senior-level or Supervisor	27	6	39	21	6

5.2 SKILL SHORTAGE

In this section we present the findings on skill shortage – the second category of skill mismatch.

STYLIZED FACTS 5: White collar jobs (managers and professionals) are harder-to-fill occupations.

We use three sectors – agro-processing, light engineering and construction sector to provide empirical support for the stylized fact 5. Let us consider agro-processing sector first which is reported in Table 9. It shows that if there is a vacancy today, or the advertisement is posted today, how long it will take to fill up the vacancy. There are four options – immediately, less than a week, more than a week but less than a month and more than a month. Longer the time it takes, harder to fill the vacancies. About 11 percent of the managers and professionals take more than a month to fill up the positions. About 61 and 56 percent of these two professions respectively take more than a week but less than a month. These percentages are much higher for other occupations. For example, crafts and plant workers are found quite easy – about 39 percent are hired almost immediately. And only less than 2 percent take more than a month.

Table 9 Agro-processing sector: Time needed to fill up current vacancies in (percentage of firms)

Occupation (BSCO 1 digit)	Immediately	Less than aweek	More than a week but lessthan a month	More than amonth
Managers	9.43	18.11	61.29	11.17
Professionals	14.33	19.45	55.63	10.58
Technicians and associateprofessionals	25.23	28.97	43.93	1.87
Craft and related trades workers	38.89	19.44	38.89	2.78
Plant and machine operators, andassemblers	22.5	30	45	2.5
Elementary occupations	27.54	27.54	43.48	1.45
Total	**16.25**	**21.69**	**53.99**	**8.07**

We find similar patterns for light engineering sector. While all workers are harder to find for this sector than the agro-processing, managers and professionals are among the hardest to hire. It takes more than a month to higher 74 percent of the managers and 67 percent of the professionals (Table 10).

Table 10 : Light engineering sector: Time needed to fill up current vacancies in (percentage of firms)

Occupations	Immediately	Less than a week	More than a week but less than a month	More than a month
Managers	0.74	10.29	14.71	74.28
Professionals	00	5.56	27.78	66.67
Technicians and associate professionals	3.51	42.11	00	54.38
Craft and related trades workers	4.44	31.11	33.33	31.11
Plant and machine operators, and assemblers	4.35	19.9	54.35	21.39
Elementary occupations	3.4	17.28	47	32.32
Total	0.74	10.29	14.71	74.28

In the case of construction sector, almost all of the workers are hired within a month, except for senior managers, engineers and administrative employees. About 60 to77 percent of the

employees of three categories get filled up vacancies in less than a month while this figure is substantially low for other technical occupations.

Table 11 Construction sector: Time needed to fill up current vacancies in (percentage of firms)

Occupation	Time required to fill up a vacant post (%)			
	Immediate	Less than a week	More than aweek but less than a month	More than a month
Senior Management	13.10	14.80	59.00	13.10
Engineering Employees	9.30	3.50	62.80	24.40
Administrative Employees	4.80	8.30	77.40	9.50
Earth Worker, Piling and Foundation Worker	16.70	43.30	40.00	0.00
Pillar and Grade-beam Builder	22.60	38.70	38.70	0.00
Rod Binder	25.80	35.50	38.70	0.00
Mason	26.70	33.30	40.00	0.00
Sanitary Worker and Plumber	31.60	34.20	34.20	0.00
Painter	28.10	31.30	37.50	3.10
Electrician	36.80	29.00	34.20	0.00
Tillers and Aluminum Fitter	25.00	34.40	40.60	0.00

The above evidence suggests that there is a supply shortage of skilled labor at the upper echelons. This implies that interventions are also required to increase the supply of white collar workers.

5.3 VERTICAL MISMATCH (OVER OR UNDER EDUCATION)

We document three stylized facts to present the results on vertical mismatch. We first discuss stylized facts 6 and 7 together as they are closely related. We use light engineering, construction and agro-processing sectors to establish the stylized facts.

STYLIZED FACT 6: On average, under qualification dominates over qualification in sectors with low level of technological sophistication.

STYLIZED FACT 7: Under qualification is higher for low level technical jobs.

Table 12 Light engineering: Percentage of firms with vertical mismatch

Occupations	Total Employment	Vertical mismatch (Years of schooling) (%)		
		Total	Over Qualification	Under qualification
Manager	183	0.64	0.11	0.53
Professional	32	0.47	0.16	0.32

Occupations	Total Employment	Vertical mismatch (Years of schooling) (%)		
		Total	Over Qualification	Under qualification
Sales and clerk	90	0.54	0.04	0.50
Technician	240	0.89	0.10	0.79
Craft and plant workers	2,614	0.88	0.13	0.75
Full sample	3,159	0.83	0.12	0.71

We observe a significant discrepancy between the desired fields of education and actual level of education. The actual level of education is about 3 years lower than what is expected by the employers for all workers (not in Table 12, see individual report). This gap is higher for the technology related workers than the management related workers. Table 12 identifies vertical with breakdown of over and under qualifications. On an average, we find staggering 83 percent vertical mismatch for the full sample. This implies that 83 percent of the firms reported that there was a discrepancy between the desired level and actual level of education. This mismatch is the highest for the technology related workers - 89 percent for the associate professionals and technicians and 88 percent for the craft and plant workers. The enterprises experience 47 percent of vertical mismatch for professionals and 54 percent for the sales related workers.

We also divide the vertical mismatch into over and under qualification. For the full sample, under-qualification dominates over-qualification. That is, the employers demand more years of education than they actually get. The share of under qualification for the full sample is 71 percent and over-qualification is 12 percent. Again, the incidence of under- qualification is the highest for the technology related workers such as associate professionals and technicians (79 percent) and craft and plant workers (75 percent). This share is highest for the sales workers (91 percent) and lowest for the professionals (67 percent).

Table 13 Agro-food processing: Percentage of firms demands SSC for various occupations

Occupation	Average qualification level desired (Percentage)	Average qualification level currently held (Percentage)
Managers	73.24	53.62
Professionals	84.7	68.81
Technicians and associate professionals	80.34	63.83
Craft and related trades workers	88.24	48.89
Plant and machine operators & assemblers	76.85	58.14
Elementary occupations	81.4	25.88
Full Sample	78.89	57.27

The agro-processing sector reports the demand for SSC graduates for various occupations as well as their current stock (Table 13). On average, about 80 percent of the enterprises desire to have SSC passed employees whereas only 57 of their workers are SSC passed.

This mismatch is the highest for the elementary occupations – 81 percent vs. 25 percent. In this case also under-education is more prominent for low level technical jobs.

Table 14 Construction sector: Differences between desired and actual level of education

Designation	Desired level of education (Years)	Actual level of education (Years)	Differences (desired minus actual)
Senior Management	17	16	1
Engineering Employees	17	16	1
Administrative Employees	17	16	1
Earth Worker, Piling and Foundation Worker	9	6	3
Pillar and Grade-beam Builder	9	6	3
Rod Binder	9	6	3
Mason	9	6	3
Sanitary Worker and Plumber	9	7	2
Painter	9	6	3
Electrician	10	8	2
Tiller and Aluminum Fitter	9	7	2

Now consider construction sector (Table 14). The employers want about a Master's degree for the senior management but end up with Bachelor's. On the other hand, for technical jobs, about SSC passed is demanded but what they get is just above primary level. In this case, employers' requirement is higher than their actual stock for the low level technical jobs compared to management level occupations, as far as education qualification is concerned.

This may have serious implications for upgrading the technological base of the enterprises. Low level of education can be an obstacle to upskill or reskill the workers to the desired level so that their skill level match with the technological advancement. This is something that the policy makers think through while designing interventions for skill development.

STYLIZED FACT 8: Over-schooling is acute in large technologically sophisticated industries.

Larger (smaller) firms are getting workers with more (less) education than they want. As larger firms are more technologically sophisticated, we find that over-education is a problem for the technologically sophisticated industries while under-education is a problem for low-tech industries. We highlight this point with an example from electronics sector. As noted before, electronics is a highly heterogeneous sector and we divide them into large and small ones.

Table 15 Vertical mismatch: Large vs. small firms (Electronics)

Occupations	Electronics (Large firms)			Electronics (small firms)		
	Total	Over Qualification	Under qualification	Total	Over Qualification	Under qualification
Manager	51.95	84.17	15.83	74.22	18.88	81.12
Professional	57.66	80.25	19.75	100	00	100
Sales and clerk	36.84	71.43	28.57	79.31	4.35	95.65

Occupations	Electronics (Large firms)			Electronics (small firms)		
	Total	Over Qualification	Under qualification	Total	Over Qualification	Under qualification
Technician	41.67	40	60	92.59	20	80
Craft and others	72.97	37.04	62.96	87.05	9.92	90.08
Full sample	57	73.17	26.83	70.19	16.33	83.47

The above table shows that vertical mismatch is higher for smaller electronics firms than the larger ones. More importantly, in the case of large firms, 73 percent reported over- qualification and 27 percent under qualification. But in the case of smaller electronics firms, the picture is just the opposite. In this case, only 16 percent over-qualification and 83 percent under-qualification. This stark difference in vertical mismatch between different sizes or technological sophistication demands an explanation.

Competition for jobs is higher for the larger firms where compensation is likely to be higher. In this case, workers may overinvest in education to signal the market to get an edge over others. On the other hand, in the case of smaller firms, recruitment is informal, and workers have other ways to signal market. In this case, employers may have private information about the quality of the workers (e.g., experience) and education may not be that important even though they want it.

5.4 HORIZONTAL MISMATCH (FIELD OF EDUCATION)

STYLIZED FACT 9: Field of education matters only for white collar jobs.

Now we turn to horizontal mismatch that is mismatch between desired and actual field of education of the workers. Note that the field of education ramifies after grade 8 in the context of Bangladesh. That is, the field of education does not matter for the workers with education below 8 grade. Since the education level of blue-collar workers is low, field of education matters mostly for white collar jobs.

This is evident in Table 16 which documents the share of science, arts, commerce, and “no preferences” as desired by the employers in the light engineering sector which is a low-tech industry. Only 19 percent of the enterprises want workers with science background while this figure is 8 percent for commerce. More importantly, 71 percent of the employers have no preferences over workers’ field of education. This share is 82 percent for the craft and plant workers.

Table 16 Light engineering sector: Share of “no preferences” are higher for blue collar jobs

Occupation	Desired qualification (science) (%)	Desired qualification (Arts) (%)	Desired qualification (Commerce) (%)	No preference for field of education (%)
Manager	0.21	0.07	0.45	0.27
Professional	0.11	0.00	0.84	0.05
Sales and clerk	0.04	0.04	0.15	0.76
Technician	0.43	0.01	0.04	0.53
Craft and others	0.17	0.00	0.01	0.82
Full sample	0.19	0.01	0.08	0.71

Table 17 and 18 highlight the same point for leather and small electronics sectors. In the case of leather, share of no preferences is 64 percent while the share of science background demanded is only 13 percent. In the electronics sector (small), 76 percent of the employers do not care about the background of education of the workers. This percentage is even higher for technical jobs – technicians and crafts and plant workers – more than 90 percent.

Table 17 Leather and leather goods: Share of no preferences are higher for blue collar jobs

Occupations (BSCO 1-digit)	Desired Qualifications			
	Science	Arts	Commerce	No preferences
Manager	11.38	19.51	42.28	26.83
Professional	62.86	0	11.43	25.71
Clerical support staff	13.33	0	40	46.67
Technical workers	8.06	2.42	3.23	86.29
Factory and machine operators and machine assemblers	11.54	0	0	88.46
Primary profession	2.04	0	0	97.96
Total	12.9	6.7	16.38	64.02

Table 18 Electronics (small): Share of no preferences are higher for blue collar jobs

Occupation (Small Firms)	Share of desired qualification (science)	Share of desired qualification (Arts)	Share of desired qualification (Commerce)	No preference for field of education
Manager	22.32	0.69	0	70.42
Sales and clerk	41.38	0	0	55.17
Technician	3.7	0	3.7	92.59
Craft and others	4.5	2.75	2.5	90.25
Full sample	18.35	1.8	4.01	75.84

The fact that employers do not have any preferences for the education background of the workers on one important aspect of skill formation – that is, formal education does not have much role in forming skill. Skill is largely formed through learning by doing in low- tech industries. This has important implications for skill development policies for the country. Note that skills formed through formal education and training are different from skills formed through only learning by doing. The latter case is susceptible to any technological shocks as they have low level of adaptability which is difficult to upgrade.

6. FINDINGS ON INCIDENCE OF TRAINING

STYLIZED FACT 10: On average, incidence of training is low and the trainings are not arranged by the employers.

Table 19 Light engineering sector: Low incidence of training and training arranged by the employers

Occupation Category	Obs.	Ever attended vocational Training? (%)		Ever attended a vocational Training arranged by the employers? (%)	
		Yes	No	Yes	No
Managers	53	16.98	83.02	15.09	84.91
Professionals	8	25	75	25	75
Technician	166	14.46	85.54	12.05	87.95
Sales and clerk	8	12.5	87.5	12.5	87.5
Crafts and other	1,287	6.99	93.01	5.59	94.41
Full sample	1522	8.28	91.72	6.77	93.23

Table 19 shows that only 126 workers out of 1522 workers (8.3) have ever attended any vocational training in light engineering sector. Among the workers, only 6.77 percent workers attended training arranged by the employers. Only 7 percent of the craft and plant workers, and 14 percent of the technicians and associate professionals received training. These training courses are mostly arranged by themselves or NGOs or the government.

The shipbuilding industry reports that only 58 trainings were received by the workers of which 17 are safety related training (Table 15). The duration of the trainings is also low. 72 percent of the training courses were of very short duration- less than a week.

Table 20 Ship building: Number of trainings in last two years. Low Incidence of training and duration of training is short

Name of the Training	Number of Training	Duration of the training				
		< 1 week	1-2 weeks	3-4 weeks	1-3 months	4-6 months
Induction	1	100				
Management	1	0			100	
Production	1	0			100	
Mechanical Training	2	50				50
Basic Training	7	100				
Functional Welding	1	100				
Drawing Training	1	100				
Technical Training	1	100				
Functional Training	8	75		12.5	12.5	
Electrical Training	5	40	40		20	
Safety Training	17	82.35	11.76	5.88		

Name of the Training	Number of Training	Duration of the training				
		< 1 week	1-2 weeks	3-4 weeks	1-3 months	4-6 months
Machine Operation	3	66.67		0	33.33	
Salvage Training	1	100		0		
Works Elements Training	2	50		50		
Equipment Training	1	100				
Modern Technology Use	1	0	100			
PMC	1	0			100	
ISO	2	100				
Ship Construction	1	0		100		
Fire Safety Training	1	100		0		
Total	58	72.41	8.62	6.9	10.34	1.72

The above tables highlight the point that incidence of training is very low. Moreover, there is not enough incentive for the employers to train their workers. Note that there are two types of training – general training and task specific training (e.g. CNC machine). Employers have little incentives to train their workers in the former type as once trained, others firm will bid away the trained workers. There may be market failure here and the government should intervene.

Interestingly, construction is an exception. The incidence of training is very high. More than half of the workers on average received training at some point in their lives. This figure is as high as 70 percent for the electricians.

Table 21 Construction Sector: Share of workers with training

Occupation	Share of workers withtraining (%)
Mason	26.50
Tiller and Aluminum Fitter	63.00
Sanitary Worker and Plumber	55.00
Electrician	70.00
Rod Binder	61.90

However, this raises a question: while the incidence of training is low for other sectors, why is it high for the construction sector? Is training in the construction sector over-supplied? Are Government, private sector, NGOs all supplying training for a few fields like construction? This is something all stakeholders should take note of it. This also calls for coordination between many government agencies, NGOs and private sectors.

STYLIZED FACT 11: Soft skill can be enhanced in service sector by training.

Table 22 Soft skill in service sector (Hotel): (proficiency level on a scale from 1-5)

Departments	At present	At the time of joining	Diff. (Std. Error)
Front Office			
Greeting guests	4.649	3.637	1.012*** (0.031)
Handling of incoming & outgoing calls	4.620	3.652	0.968*** (0.033)
Language proficiency	4.484	3.558	0.926*** (0.032)
Food and Beverage (Service)			
Serving and managing guests with politeness	4.636	3.644	0.993*** (0.036)
Complaint handling	4.592	3.607	0.986*** (0.034)
Others			
Hygiene and cleanliness	4.757	3.797	0.959*** (0.036)
Time management skills	4.633	3.684	0.949*** (0.034)

There is a debate whether soft skills can be taught. The example above for hotel indicates that it can be. This sector reports a few relevant soft skills at the time of joining and at the time of interview and reveals that the soft skills of the workers have increased overtime through in-house trainings. One lesson for designing training program for the service sector is that soft skill should be an integral part of the interventions.

7. SKILL DEMAND PROJECTION AND OCCUPATIONS WITH HIGH DEMAND

Light Engineering

We collect information on the occupation wise projection of the workers in the next 5 to 10 years, both qualitatively and quantitatively. According to Table 23, about 12 percent of the firms think that there will not be any growth of jobs in the coming years. About two-thirds believe that there will be moderate growth, driven by the growth of the professionals and associate professionals (89 percent). Then we wanted to know the number of the workers the firm is expected to have in 2023, 2025 and 2030. Compared to 2019, the respondents believe that the number of workers will increase by 34 percent, about 8.2 annual growth rate. However, the growth of the jobs of the managers and professionals are bleak in the next 4 years – about 10-13 percent. In 2019-2025 period, expected growth of the firms in terms of the workers is about 78 percent, which is more than 12 percent. By 2030, the expected growth of the total workers is 145 percent, with more than 13 percent annual growth. It appears that the longer-term outlook is better, as projected by the firms.

Table 23 Growth projection of the workers by occupations

Occupation	Total employed in 2019	Growth of the number of works in next 5 to 10 years					Percentage increase in 2023 relative to 2019	Percentage increase in 2025 relative to 2019	Percentage increase in 2030 relative to 2019
		Negative growth	No growth	Moderate growth	High growth	Very high growth			
Manager	183		41.61	56.93	1.46		13	48	96
Professionals	32		11.11	88.89			10	84	147
Technician	90	0.88	3.51	88.6	6.14	0.88	34	82	147
Sales and clerk	240		13.04	73.91	13.04		35	93	180
Crafts and other	2614	0.88	7.52	61.4	28.95	1.16	35	79	145
Total	3159	0.72	11.59	64.6	22.01	1.08	34	78	145

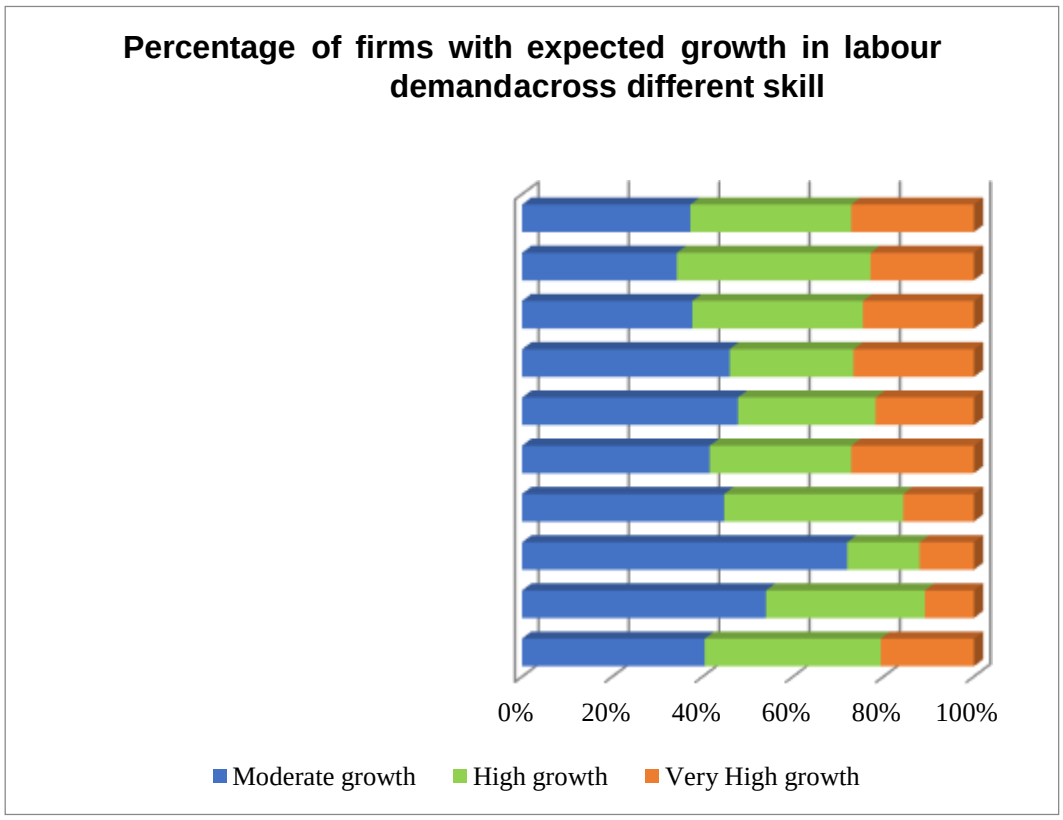
Electronics

According to Table 24, about 3.13 percent of the firms think that there will not be any growth of jobs in the coming years. Whereas, about two-thirds believe that there will be moderate growth, driven by the growth of managers (89.84 percent) and professionals (91.14 percent). Then we wanted to know the number of the workers the firm is expected to have in 2023, 2025 and 2030. Compared to 2019, the respondents believe that the number of workers will increase by 39.56 percent, about 9.89 annual growth rate. In 2019-2025 period, expected growth of the firms in terms of the workers is about 78 percent, which is a 13 percent annual rate. By 2030, the expected growth of the total workers is 127.83 percent, with more than 11.6 percent annual growth. It appears that the longer-term outlook is better, as projected by the firms.

Table 24 Growth projection of the workers by occupations

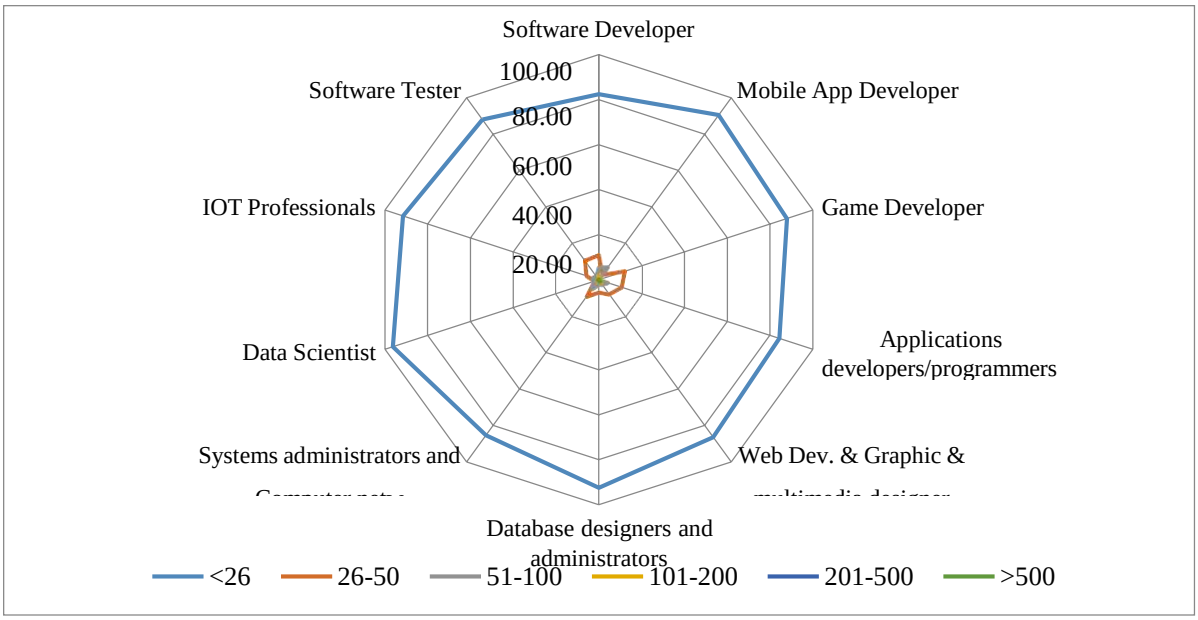
Occupation	Total employed in 2019	Growth of the number of works in next 5to 10 years				% increase in 2023 relative to 2019	% increase in 2025 relative to 2019	% increase in 2030 relative to 2019
		No growth	Moderate growth	High growth	Very high growth			
Manager	227	7.03	89.84	3.13		33.92	80.18	146.26
Professionals	126	1.27	91.14	5.06	2.53	98.41	197.62	323.02
Technician	1692	2.97	71.75	24.91	0.37	44.62	83.63	128.84
Sales and clerk	386	4.17	71.67	22.5	1.67	66.58	131.61	204.15
Crafts andother	6214	2.42	60.97	35.16	1.45	35.52	70.61	118.18
Total	8645	3.13	69.41	26.32	1.15	39.56	77.99	127.83

ICT



Expected demand for professionals by 2023

More than 80% of the firms are expected to increase the number of almost all professionals to 26 or less by 2023 (). The following designations are considered: Software Developers, Mobile App Developer, Game Developer, Applications developers/programmers, Web Development and Graphic and multimedia designer, Database designers and administrators, Systems administrators and Computer network, Software Tester, Data Scientist, IoT Professionals.



Leather and Footwear

Table 25 reports the extent of average growth in labor demand in next 5-10 years across BSCO code 1-digit level occupations in the Tannery industry. It shows that high growth in the existing jobs of the Tannery industry of Bangladesh seems not possible. However, enterprises think that there will be “Moderate growth” in labor demand in the next 10 years in all occupations like Factory and machine operators and machine assemblers (86%), Technical workers (78%), and Service and Sales Staff (61%), etc. Hence it is expected that the Tannery industry in Bangladesh may demand labor for employment in the industry and this statement is corroborated by the views of enterprises who view that overall, there will be 55% moderate growth and 6% high growth in labor demand in next 10 years.

Table 25 Extent of Average Growth in Labor Demand in next 5-10 years across BSCO Code 1-digit level Occupations in the Tannery Industry

BSCO code1-digit	Occupations	No Growth	Moderate Growth	High Growth	Very high growth
1	Manager	71.43	26.53	1.02	1.02
2	Professional	37.04	59.26	0	3.7
4	Clerical support staff	54.55	36.36	9.09	0
5	Service and Sales Staff	39.13	60.87	0	0
7	Technical workers	10.28	77.57	6.54	5.61

BSCO code1-digit	Occupations	No Growth	Moderate Growth	High Growth	Very high growth
8	Factory and machine operators and machine assemblers	9.09	86.36	4.55	0
9	Primary profession	30.56	41.67	27.78	0
	Total	36.73	54.63	6.17	2.47

Table 26 illustrates the projected number of job growth across BSCO code 1-digit level occupations in the Tannery industry in Bangladesh. Overall, the Tannery sector will experience around 11% job growth across all occupation categories by 2023. It is expected that the industry will have a 45% employment growth in 2025 from current stage and the same figure rose to around 98% in 2030. It indicates an encouraging prospect of the Tannery industry of Bangladesh.

Table 26 Projected number of Job Growth across BSCO Code 1-digit level Occupations in the Tannery Industry

BSCO code 1-digit	Occupations	Growth (%) with respect to current level of employment		
		By 2023	By 2025	By 2030
1	Manager	11.03	32.31	59.21
2	Professional	21.91	59.25	106.31
4	Clerical support staff	-31.43	-20	-2.86
5	Service and Sales Staff	-23.19	-1.45	24.64
7	Technical workers	16.25	62.98	158.26
8	Factory and machine operators and machine assemblers	30.04	83.58	138.71
9	Primary profession	6.14	33.02	67.13
	Total	10.96	44.56	97.75

Source: BIDS-Skill Survey 2020-2021

Construction

Projection on labor and their changing demands were an integral part of the study. We collected the opinions of the employers on what they think would happen to the labor demand growth of the industry. Almost all the labor categories other than tiling and thai mistry would show moderate growth in the near future (Table 27). Next, high growth would prevail for the labor categories. There would be no such thing as very high or negative growth for the employees. Moderate and high growth scenarios are to be more common for all the employees of the construction industry. For the newly introduced or relatively new in-demand posts, the same situation prevails. These labor occupation categories would mostly show moderate to high growth. It is important to note that the labor growth scenario in this industry is going towards bringing about positive changes meaning that labor demand is likely to increase in the upcoming days.

Table 27 Labor Demand Growth in the Future (for Existing Posts)

Occupation	No growth (as usual)	Moderate Growth	High growth	Very high growth	Negative growth
Senior Management	56.50	36.60	4.20	0.00	2.80
Engineering Employees	1.70	77.00	18.50	1.70	1.10
Administrative Employees	9.40	70.70	19.40	0.00	0.50
Support Staffs	0.00	76.90	23.10	0.00	0.00
Earth Worker, Piling and Foundation Worker	4.90	74.50	11.80	0.00	8.80
Pillar and Grade-beam Builder	4.90	74.50	10.80	1.00	8.80
Rod Binder	9.70	75.70	14.60	0.00	0.00
Mason	4.90	80.60	13.60	1.00	0.00
Sanitary Worker and Plumber	5.80	79.60	14.60	0.00	0.00
Painter	5.80	74.00	14.40	0.00	5.80
Electrician	3.90	75.00	21.20	0.00	0.00
Tiller and Aluminum Fitter	5.90	72.60	15.70	0.00	5.90
Others	4.10	83.70	12.20	0.00	0.00

Though the overall employment growth of the industry leans towards the possibility of moderate to high growth, when asked about quantifying these growth amounts, employers reported that the changes would come gradually. Thus, while the average number projected for different employee categories seem to increase in general, this is coming at an increasing rate. The projected employee numbers are the lowest for 2023, in 2025 and 2030 the numbers are increasing.it is evident from the projected data that, labor demand would change more for the manual labor employees than the management, administrative, engineers, and their supporting staff. For the labor categories that are going to be in demand in the future, there are seen increasing employment too.

RMG Sector

We asked the employers about their projection about possible changes in the labor demand market of RMG industry. Data has been collected for each category of occupations in the RMG industry. Below we show the graphical presentation of the projected changes in both the knit and woven industry. When the employers were asked about the direction of labor demand growth, they based their answers on 5 options including no growth in the labor demand, moderate growth, high growth, very high growth and negative growth. According to the survey data, labor growth in the knit industry would mostly be moderate (76% respondents/firms) in the next 5-10 years, followed by high labor growth projection by 12% firms, negative growth projection by 6% firms, no growth projection by 4% firms and very high growth projection by 2% firms. As this is a perception-based estimate, we can say that most knit firms expect to see moderate growth in the labor demand market.

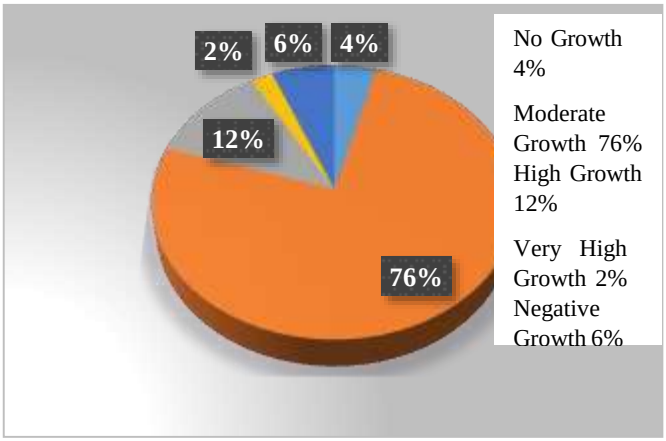


Figure 4 Projected Direction of Labor Growth Changes in the Knit Industry

Labor growth projection by the woven garment firms indicate that like in the knit industry most firms expect moderate growth in the labor demand scenario (81%), followed by projection of high growth by 11% firms, no growth by 5% firms and negative growth for 2% firms. To sum up, in the next 5-10 years, employers expect there to be increase in the demand of labor.

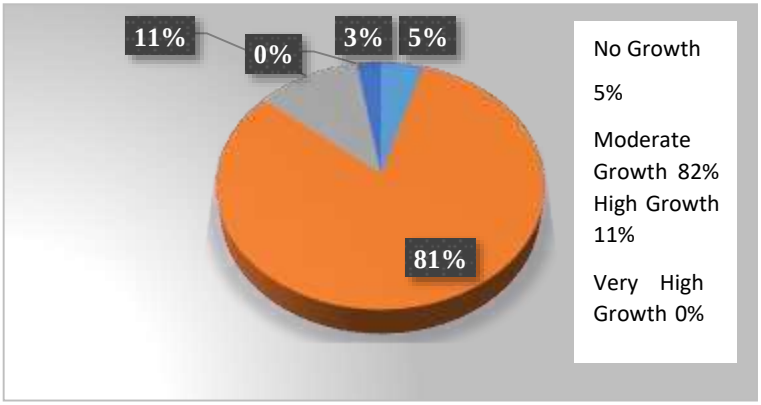


Figure 5 Projected Direction of Labor Growth Changes in the Woven Industry

We further see if there is growth in labor demand in the future what would be the extent of growth in the employees of RMG industry. We asked both knit and woven RMG employers to predict possible composition of labor in the next few years. It is noted that employment growth is predicted to be moderate in those years as was predicted and reported through the direction of labor growth projection. Overall employment in both the knit and woven industries would increase in the upcoming years.

Hotel and Tourism

Table 28 Level and Growth of Employment by Sub-sector and Skill Level

Enterprise/ Department	Skill Category	Average Number of Workers			Growth (%) in Employment between		Number of years required to reach employment level of 2019 from the level of 2020
		2018	2019	2020	2019 & 2020	2018 & 2019	
Hotels and Resorts							
Front Office	Skilled	1.5	1.5	1.4	-7.4	3.3	2.2
	Semi-Skilled	3.4	3.6	3.2	-12.0	5.7	2.1
	Unskilled	2.7	3.1	2.4	-23.4	12.8	1.8
	All	7.6	8.2	7.1	-15.2	7.8	1.9
Food and Beverage (Service)	Skilled	1.4	1.5	1.4	-8.3	8.3	1.0
	Semi-Skilled	2.1	2.2	2.0	-9.8	6.0	1.6
	Unskilled	7.5	7.9	6.7	-16.6	5.5	3.0
	All	11.0	11.7	10.1	-14.2	5.9	2.4
Food and Beverage (Production)	Skilled	3.1	3.3	3.2	-3.7	7.3	0.5
	Semi-Skilled	4.7	5.0	4.3	-13.4	6.5	2.1
	Unskilled	3.6	3.8	3.5	-9.3	5.9	1.6
	All	11.3	12.1	11.0	-9.4	6.5	1.4
Housekeeping	Skilled	1.7	1.8	1.7	-5.3	2.9	1.8
	Semi-Skilled	7.6	8.1	7.2	-11.9	6.3	1.9
	Unskilled	2.1	2.2	1.9	-15.2	3.2	4.7
	All	11.5	12.1	10.8	-11.5	5.3	2.2
All Departments		**41.4**	**44.1**	**39.0**	**-12.3**	**6.3**	**2.0**
Travel Agencies	Skilled	1.3	1.4	1.3	-6.7	3.7	1.8
	Semi-Skilled	4.3	4.4	4.0	-10.1	2.1	4.9
	All	5.6	5.8	5.3	-9.3	2.5	3.8
Tour Operators	Skilled	2.3	2.3	2.0	-17.8	0.0	4.8
	Semi-Skilled	5.2	6.0	4.5	-27.5	12.7	2.2
	All	7.6	8.3	6.5	-24.7	9.0	2.8
Travel Agencies and Tour Operators	Skilled	1.4	1.4	1.4	0.0	0.0	0.0
	Semi-Skilled	7.2	7.7	7.7	0.0	6.7	0.0
	All	8.6	9.1	9.1	0.0	5.7	0.0

Source: BIDS Survey, 2020

Note: Growth between period t and t+n is calculated as $[\ln Y_t - \ln T_{t+n}]$. Year 2018 and year 2019 were normal economic years while the year 2020 is a pandemic year.

The projected count on average employment for each enterprise as well as the whole sector is reported by the sector, departments, and skill level in Table 28. The latter is obtained by multiplying the enterprise level averages by the count of the total number of projected establishments as reported in Table 23. All the projections are based on a constant yearly growth

rate reported in Table. The projection reveals that demand for workforce in the hotels and resorts would grow by 34% in 2025, 89% by 2030, and 144% by 2035 compared to the level of 2019. The corresponding numbers for the travel agencies are 19%, 58%, and 97%. Compared to the current level, the potential workforce in the enterprises operating both as travel agencies and tour operators may grow by 46% in 2025 and 104% in 2030. Considering the projected growth rate of skilled and semi-skilled workers in the next 5-15 years, the areas of high potential for skilled workers are food and beverage production, food and beverage services, and housekeeping in the hotels and resorts. While the former two departments in hotels and resorts would observe an explosion for both skilled and semi-skilled workers, the latter would largely demand more semi-skilled workers.

Nursing

Table 29 Demand for Nurses based on alternative assumptions and indicators

Indicators	Basis	2015	2020	2025	2030	2035
Population (in millions)		158	168	178	189	200
Demand for Doctors:						
WHO Doctor population ratio:	(1,000: 0.256)	40,448	42,917	45,536	48,315	51,264
Bangladesh (2015)	(1000:0.47)	74,260	78,792	83,601	88,704	94,117
South Asia	(1,000:0.75)	118,500	125,732	133,406	141,548	150,187
Middle income countries (as of 2013)	(1000:1.28)	202,240	214,583	227,680	241,576	256,320
Demand for nurses based on Population/Nurse Ratio:						
GOB estimate based on 2014	(4,061:1)	38,907	41,281	43,801	46,474	49,310
WHO Population/Nurse Ratio	(1,000:0.768)	121,344	128,750	136,608	144,945	153,792
Indian average (2012)	(1,000: 1.1)	173,800	184,407	195,662	207,604	220,275
Demand for nurses based on doctor-nurse ratios:						
WHO doctor-population ratio of 1,000: 0.25 combined with different doctor nurse ratios	1:1	40,448	42,917	45,536	48,315	51,264
	1:2	80,896	85,833	91,072	96,630	102,528
	1:3	121,344	128,750	136,608	144,945	153,792
South Asian population- doctor ratio of 1,000: 0.75, combined with different doctor nurse ratios	1:1	118,500	125,732	133,406	141,548	150,187
	1:2	237,000	251,464	266,812	283,096	300,374
	1:3	355,500	377,196	400,218	424,644	450,561

Based on alternate assumptions about population nurse ratio, projected demand for nurses in Bangladesh in the year 2035 is estimated to vary between 49,310 and 220,275. The Lowest figure is based on the assumption of one nurse per 4,000 Population as observed in Bangladesh – based on 2014. The highest figure assumes a population nurse ratio of 1,000:1.1. Both the figures are based on assumptions far apart from the experiences of other countries and regions.

Projections based on population - doctor – nurse ratios, on the other hand, give a much higher number for the future demand for nurses in the country. The underlying assumptions are basically the prescribed number of nurses per doctor – 1, 2 or above. WHO recommends a doctor nurse

ratio of 1:3 – 3 nurses for one doctor, which in the Bangladesh context is far fewer – less than 0.5 nurse per one doctor. Based on 1:2 ratios, the minimum projected demand for nurses in 2035 will be 102,528. It underlines a population doctor ratio of one doctor for every 4,000 people – an extremely low figure to recon. On the higher side, the demand for nurses will be 450,561; based on the assumption of 0.75 doctors per 1,000 people or 3 doctors per 1,000 people as per the South Asian country experiences.

8. RECOMMENDATIONS

8.1 GENERAL RECOMMENDATIONS FOR SKILL DEVELOPMENT

i. Broader Definition of Skill is Required

As we know there are various types of skills such as cognitive, non-cognitive or soft, and technical skills. These three are the important determinants of the individual earnings. Moreover, the distinction between transferable (general) and non-transferable (occupation or task specific) skills helps justify government interventions. Understanding and recognition of the importance of different types of skills is central to designing an overarching implementable framework for skill development. The definition used in current policy documents is very narrow and focuses only on the technical skill, ignoring the cognitive and soft parts of it. It is also empirically established that the level of technical skill acquisition critically hinges on the level of cognitive abilities. Therefore, it is essential to define skills with a larger scope by including its all aspects.

ii. Skill Acquisition is a Life Long Learning

The concept of lifelong learning entails the creation of opportunity for learning and skill acquisition at any age of life. Being a central theme of SDG4, it also helps guide the skill development strategy of a country. Any person at any age should be able to learn something new and it is the responsibility of the government to create the enabling environment for it. The education ecosystem that supports the lifelong learning promotes early childhood development, adult literacy and training, no entry barrier to general education and TVET based on age, seamless movement between general and vocational education, etc.

iii. Clear Understanding of How Skill is Formed

What constitutes skills? What makes a welder a proficient one ? Cognitive skills earned at the primary and secondary level, off-job training at training institute, on job training, experiences, etc. matter in producing a skilled welder. That is, understanding of the skill production function - the factors and the process that contribute to skill production, is essential for designing the skill development framework. Hence, the role of vocational training cannot be seen in isolation; it has to be embedded in the overall education system of the country. Without solid foundation in the primary level, we cannot expect better outcome in the secondary level and similarly, sound primary and secondary training lays the foundation for skill accumulation in the vocational education as well as in the tertiary level. ‘Skills beget skills’, though sounds like a catch-22 problem, - is the main mantra for any skill development strategy.

iv. Alignment of Education and Skill Development Policies with Industrial Policy and Long-Term Plans

Every developing country has an aspiration and plan on how to grow and how to grow fast. Hence the policy makers envisage the share of manufacturing along the transitional path and the sectors that will push the manufacturing growth. This projection is laid out in the Five Year Plan and the Industrial Policy which elaborate the details of the route to higher industrial growth in Bangladesh. One of the critical elements required for industrial growth is the human capital. That is, the plan for developing human capital has to be aligned and consistent with the industrial policy and growth strategy. Education and skill development policies cannot be stand-alone documents. Since the country aspires to become an upper middle country by 2030, it is essential to invest in human

capital to help grow the thrust sectors as defined in the industrial policy. The polices that highlight the trade-offs between STEM (Science, technology, engineering and mathematics) vs. other streams, between general and vocational education, between tertiary vs. non-tertiary education have to be aligned with the industrial policy and the projected growth path of the country.

v. Sector Wide Approach (SWAp) for Secondary Education and TVET

The discussions have started to adopt sector wide approach for secondary and TVET education. The lessons learnt from the SWAp of the primary education and health sector can be applied to the secondary education and TVET to enhance the efficiency of the use of resources and to avoid duplications through better coordination.

vi. Informed Agent: Easily Accessible Information on Skill Development Opportunities

The ideal framework for skill development should create such an enabling situation so that all can make informed decision about the choice of education stream, disciplines and career. Is the rate of return of vocational education is higher compared to comparable groups who choose general stream? How many students who pass SSC and HSC are aware of the vocational stream, particularly in the rural areas? How many are them are aware of the job prospects of different education stream? Anecdotal evidence suggests that there is a severe lack of awareness about the vocational education and its job prospects. While the government is expanding the reach of the vocational education, the need for demand side interventions such as social campaign is absent in the current policy debate on education and training. Therefore, creation of informed citizens about the full spectrum of opportunities of education and skill development is a precondition for the human capital development strategy of the country.

vii. Social Recognition for Vocational Education

How society values a graduate of the vocational education also determines the success of these institutions and the overall skill development interventions of the government. Therefore, it requires to invest in image building of these professions.

viii. Data to Track Sector Specific Skills and Skill Mismatch

Unfortunately, we don't have the data to track the skill level and skill mismatch at the sectoral level. In order to keep track of the progress and monitoring, we need quality data to be generated at regular basis. In order to monitor the progress of SDG-4, we also require such data. To this end, BBS can take the initiative to conduct separate survey on skills or can include a module in the existing labor force survey. A subsample can also focus on cognitive and non-cognitive abilities.

ix. Greater access to finance for acquiring new technology and up-skilling

Access to finance has been identified as the major challenge for skill up-gradation of the light engineering and electronics sector. The business leader pointed out that they do not get the necessary finance especially when they need a large amount of capital for upgrading or expansion of the business. Since banks also do not provide loan without mortgage, a third party guarantee by the government or the association might help address this problem. Short grace period and short tenure for repaying the loan are the two other challenges faced by these sectors. Instead of banks, the businesses prefer MFIs as the source of credit. But the size of loan and short tenure make the borrowers use the loans less efficiently. The business leaders asked for a separate body for SME loans disbursement - similar to PKSF. They are not at all satisfied with the role of the SME Foundation as far as access to credit is concerned.

x. Fostering industry-TVET linkage

We found in our study that the linkage between industry and TVET is very low. Enterprises hardly send their employees to the training institutes and training institutes, largely pubic ones, hardly reach out to the industry. While there is a law that certain fraction of the workers must be apprentice, the enterprises hardly follow this law and there is no monitoring from the government. An implementable framework is required to foster industry-TVET linkages.

xi. Greater access to institutional training

Our findings show that the floor workers of the light engineering sector have hardly any institutional training. The workers learn by doing work. While the on-job training is important, it may limit the growth of the skill sets of the workers because of the lack of theoretical knowledge. Special courses can be introduced for the workers who are already in the jobs to complement their skill acquired through learning by doing. This course should be certified by BTEB or NSDA. All floor workers of the light engineering sector should be brought under a program for up-skilling and reskilling.

xii. Preparation for embracing 4IR

While the industry leaders are not worried about the automation and the threat that 4IR poses, it is important for the government to start preparation for this transition. According to a study conducted by the Aspire to Innovate (A2i), about 5.5 million people is likely to lose their jobs in the next 10 years in Bangladesh due to the 4IR. However, it is also expected that this new wave of technological revolution will create about 10 million jobs.

Some of the sectors where most of the jobs will be created are Industrial Robotics control, automated packaging, Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM), 3D printing, internet of things, cyber security, and big data analytics, etc. This has serious implications for the light engineering sectors as this sector will experience a transformation from labor intensive sector to capital intensive ones in the near future to sustain in the global competition.

8.2 SECTOR SPECIFIC RECOMMENDATIONS

Light Engineering and Electronics

i. Greater focus on mid-level to advanced courses

Basic courses are generally offered by public, private and NGO operated training institutes. While there is a huge demand for such basic courses, the comparative advantage of SEIP lies in offering mid-level to advanced level courses.

ii. Technical vs. management trainings

SEIP has partnered with Bangladesh Bank and other institutions and is offering management training. While the management training for the mangers is important for any businesses, we believe SEIP is meant to offer technical training and this is where its comparative advantage lies.

iii. Soft vs. hard skills

Soft skill is now recognized as a major input of workers' skill sets. This is not necessarily the management training. SEIP can consider introducing teaching soft skills to the workers in the next phase.

iv. Technical institutes should be the prime vehicle for delivery

SEIP is now partnering with business associations, training institutes, Bangladesh Bank, universities and private sector. While this experimentation is good for learning about which works best, we believe strengthening of the current institutions mandated to impart training should be the key delivery vehicle of the trainings by SEIP. There is no need to create new institutions or any temporary bodies to impart training.

v. Fresh trainees vs. on-job training

Discussion with the SEIP personnel reveals that about 80 percent of the trainees are fresh ones and 20 percent are from industry. It is important to know which target group results in better outcomes in terms of up-skilling, reskilling and career growth of the workers.

vi. Partnership with industries

While SEIP works with the business associations, SEIP can partner with large businesses as they operate on the frontier of technology. What these large conglomerates are doing now will define the paths that will be followed by other industries in the future. It is essential to understand the types of training these large enterprises are imparting to their workers and how these types of training can be customized to offer for others.

vii. Ranking of training institutions

The potential trainees don't have much information about the quality of the training institutes. SEIP can take initiatives to create a ranking of these institutions similar to universities based on quality of teacher, course curricula, job market outcomes, etc. The ranking will also inform the potential students to learn about the quality of the training institutes and make informed decisions.

viii. Offering scholarship to the trainees

Our field survey reveals that many potential fresh trainees cannot take part in the program due to their other income earning activities. If they are compensated for their time, even partially, this may increase enrollment and induce greater learning.

ix. Demand side interventions

SEIP should seriously think of the demand side interventions regarding information provision. Our field visits suggest that many potential trainees do not have any information about the training offered by many institutes. Information campaign can be an integral part of the second phase of SEIP.

x. Partnering with international training institutions

There are many international training institutes in Korea, Malaysia, Singapore and Middle-east. Collaboration with these institutes and the provision of certification can help increase the demand of workers from Bangladesh to these countries.

Agro-processing sector

i. Since, the enterprises emphasized that increasing training activities is the number one solution that they think can minimize the skill gap. we asked them what types of trainings they need for the current occupations. Based on the responses we listed top 17 trainings that the agro processing enterprises think that their employees currently need.

ii. Trainings should be for management and processing and management of different product lines, not just the ones which are most demanded at the moment. And this should take into account the future expansion plans of the enterprises. However, for this to happen with some foresight, it would be advisable to depend not only on what enterprises think, but there should be projections of demand for agro-processed foods both for home consumption and exports. This should also examine where automation mainly for raising productivity but without much labor displacement may happen. Results for such studies should be disseminated to the investors for helping them taking forward looking decisions for investment in expansion and hiring people with appropriate skill.

iii. Regarding one issue that has come up is the unwillingness of enterprises to spend money or send people for training because of the fear that the newly trained people may not join back. This needs to be looked into and find out based on present industrial laws and policies if there is a way out. One way could be that the association of enterprises should have a gentlemen's agreement among themselves not to engage such newly trained people from another firm at least for a year or so. Additionally, the employees may have to execute a bond with the employees that after training depending on costs and who bear them as well as length for training or its nature, to serve the mother organization for a specified period. On the other hand, employers too should think about raising salaries for the newly trained people if after a certain time of training it is found that their productivity has actually raised.

iv. Training and awareness raising related to food preservation, specially maintaining the temperature for storage and during supply/delivery should be a priority activity among all actors in the supply chain from the farmers to the processing enterprise as well as for the finished products from the enterprise to the consumer. To make this happen, apart from awareness raising and training simultaneously investment for cold supply chain should be geared up either by the enterprises on their own or through third party (private/public or a mixed PPP). It is likely that while large enterprises may invest on their own, for the small and even medium enterprises, this may not be possible to manage not just finance but also actual management of the supply chain on a day-to-day basis. A third-party supply chain system including appropriate cold chains should be the order of the day. Appropriate credit may be arranged for such an investment.

ICT Sector

The increased market demand for skilled laborers in the ICT sector raises the demand for a skilled workforce with more advanced training rather than semi-skilled labor with basic training. To mitigate the problem, industry stakeholders propose to combine elementary and advanced courses in one particular discipline. It is also proposed to provide training on both elementary and advanced courses of only one particular discipline/subject; rather than providing the scope of receiving training on only one course. A few recommendations are made below to make the existing SEIP training programs more effective and target-oriented:

i. Flexibility in course intake: The regulations for the trainees who participate in the training under SEIP do not have the provision to be enrolled in two courses of the same subject. Therefore, despite the interest to receive further training in advanced courses, the participants are restrained to do so which eventually results in the underutilization of their potential and skills. Even for some advanced courses, participation in earlier courses is necessary. Therefore, it is felt that this issue needs to be resolved in a practical way so that participants can get the maximum benefit out of the training.

ii. Financing the training: Given the resource constraints of SEIP, the provision of facilitating advanced training to the participants who already received training at the elementary level might not be a viable solution. In that case, self-financed training on advanced courses can also be allowed where enrollment in training will be contingent upon payment of certain course fees. If a certain portion of the training costs are subsidized and the rest are carried by the participants, the trainees seem to be self- motivated and interested enough to develop their skills through these advanced training and the programs will be sustainable.

iii. Branded certification: One suggestion from BASIS is to promote branded certification such as Microsoft certified professionals, CISCO certified networking engineers, ADOBE certified graphic designers, etc. which will facilitate the branding of the IT sector of Bangladesh. The required training in this sector is already provided but this training needs to be certified by International brand companies through appearing in the examinations conducted and controlled by brand companies. However, appearing in brand-led examinations is really costly and SEIP can contribute to this procedure by providing the exam fee for those examinees who participate in the SEIP training.

iv. Decentralization: It is suggested to promote the decentralization of training facilities across the country instead of concentrating on the capital city only. BASIS already has a training center in Chittagong and planning to establish it in another region. BCS is planning to establish one training center targeting the hardware sector. The initiatives by SEIP in establishing training centers all over the country will definitely facilitate the process of capacity building for the skilled labor force by increasing the number of participants.

v. SEIP may incentivize job replacement of female trainees: Being a cross-cutting sector, around 1 million IT professionals are placed in various jobs in the country. Only 0.22 million IT professionals are working in the IT industry while the major portion is involved in IT services in the different non-IT sectors. Hence, the IT sector provides the opportunity to increase female employment in this sector. At present, female participation in the IT sector is 12-13% whereas female participation at the management level is only 2%-3%. SEIP may incentivize job replacement of female trainees (if currently employed in another sector) and encourage employers to recruit female trainees.

vi. Courses on Computer Applications should be included in SEIP training: The graduates from formal institutions are not largely aligned with the required skills in the industry. The academic training is mostly concentrated on theoretical knowledge instead of practical orientation. For example, students are not well-trained in programming and they lack the skills to produce creative and innovative ideas which eventually created difficulties in meeting the goals set by the employers. The CSE students should be primarily encouraged and groomed as programmers and adequate lab facilities and activities should be ensured. For example, in India, there is a comprehensive bachelor's and master's course in applications of software/programming named Masters in Computer Application (MCA) and Bachelor in Computer Applications. These types of courses are really helpful in getting a job immediately as the students are trained up with practical usage of computer applications. It is emphasized to initiate such courses in SEIP interventions. Even SEIP may collaborate and provide capacity-building support to some academic universities to upgrade their curriculum in line with industry needs. UGC may play a vital role in enhancing the industry-academia linkage in this sector.

Apart from the above recommendations on existing SEIP training programs, some other complementary issues need to be addressed to improve the required human capital for the ICT sector.

vii. The lack of R&D facilities is one of the major reasons for the existing skills gap in the ICT sector. Active Network Unit (ANU) used in networking and ANU manufacturing has a lot of demand but in Bangladesh no workforce with the required skill is available. Necessary skills need to be developed to tap the potential of ANU.

viii. The government needs to reduce internet prices further so that the digitalization goals set by the government can be achieved. For the 4IR, internet price needs to be more affordable and cabling and hardware need more attention in terms of policy support as they are completely different subsectors.

ix. To develop the ICT hardware sector, it is important to train the available workers (hardware and maintenance) using its own syllabus focusing on hardware applications. The BCS has already created its own training center, but financial support is required to make the center operational. Any support from SEIP for the BCS training Center would be very supportive.

x. Bangladesh should aim on flourishing e-commerce, digital marketing, or e-trading. More training can help firms to survive as there is high competition in this market.

xi. Graphic Design and Android Programming are two areas where the companies are outsourcing foreign employees as the indigenous labor force do not have the advanced skill. SEIP may design training programs for Graphic design and Android programming, and it also needs to design training programs for professionals involved with AI, big data analytics, robotics, gaming, IoT, etc.

Finally, the support from the policymakers and their understanding of the problems is critical to the development of the ICT sector and overall digitalization. Policymakers need to change their mindset toward the overall development of the IT sector including the development of human capital. It is often complained by the industry stakeholders that their suggestions have never been addressed with adequate attention. The government's new ICT policy includes all associations and they are all connected, but constant support from the government is needed for the development of this industry.

Leather and Footwear Sector

Overall, the Leather and Footwear industry will experience around 9% job growth across all occupation categories by 2023. It is expected that the industry will have a 30% employment growth in 2025 from current stage and the same figure rose to around 64% in 2030. It indicates an encouraging prospect of the leather industry of Bangladesh. Survey findings corroborate the idea that hard-to-fill vacancies arise due to the skill shortage that is why, it is suggested to impart training to the existing labor force involved in the leather industry. It particularly appears to be a second suggestion that can be taken in near future to address hard to fill vacancies in the Leather and Footwear Industry. Moreover, the purview of training should be extended to such a level where the new comers in the market can as well avail of training facilities.

The following steps could be taken to encourage improvements in skill and production in Leather & Footwear sector:

i. What actions should be/will be taken in near future to address the problem of skill gap across occupations in the industry need to be understood for the development of this

sector. Training activity of practical work, more supervision of staff and more staff appraisals / performance reviews, training activity of practical work, and reallocating work appear to be the first three important actions for addressing the problem of skill gap in the Leather & Footwear Industries in Bangladesh.

ii. Need to establish more programs on Industry-led Apprenticeship.

iii. CETP at the 'Savar Leather Industrial Park' needs to be functioning for achieving the target in the international market.

RMG Sector

Given the findings from the surveys and discussion with experts, we may suggest the followings for minimizing skill gaps RMG industry in Bangladesh.

i. This study has revealed various gaps prevailing in the RMG industry of Bangladesh. We observe such gaps both in knit and woven RMG industries in general. However, gaps differ between different occupation categories. Therefore, future skill enhancing programmes need to provide more attention to the occupations where the gap is higher. According to the survey findings, skill training programmes are mostly required for lockstitch machine operator, flatlock machine operator, overlock machine operator, printing machine operator, quality inspector, chain stitch machine operator, embroidery machine operator and cutting activities. However, the situation is rapidly changing.

ii. The Skill for Employment Investment Program (SEIP) under the Finance Division of the government which is providing several training programmes for the RMG industry (along with other strategic industries), should have a mechanism to continuously update the course curricula according to the rapidly changing technology.

iii. We need more public private partnership to ensure training on various cognitive and non-cognitive skill development for existing employees and entry level employees. As we noted that employers are ready to pay higher for quality workers, enterprises should have close linkages with training providers so that trainees could get internship in factories and in turn the enterprises will get good quality workers.

iv. More agencies should be there to ascertain job placement for the trained and new graduates.

v. National Skills Development policy, 2020 should be implemented with proper human resource enhancement of the National Skill Development Authority.

vi. As RMG is the prime industry in Bangladesh, we may include RMG related skill training in the post-secondary level of education.

vii. Collaboration between regional colleges/universities that provide management and technological training to the employees and RMG industries. A program was introduced in Taiwan, China like this.

viii. Workers face information gap regarding good quality training prgrammes. SEIP needs to expand communication network in rural areas. Union digital centers of the government could be utilized as an information hub for informing remotely located people regarding the availability of RMG industry related training in the closest possible proximity. Circulating

information on TVET should also be enhanced as many still are not well aware of the skill training available there.

ix. We need to expand more entry level training programmes.

x. Introducing management r trainings for the managers and management employees is required. . Evidence from survey data indicates that these occupation categories in the woven industry have the higher skill gaps than others in the same industry.

xi. Introducing technological courses for the employees specializing on their job description i.e. under broad categories of cutting machine operator, sewing machine operator, finishing operator, fusing machine operator, printing machine operator, embroidery machine operator, quality inspectors and quality controllers is also important.

xii. Introducing longer on the job training for the employees can help employers get better quality workers. This can be done for one day a week to going for facilitating trainings for a duration of few weeks to one to three months. Employees involved in the production industry can be rotated in the trainings to make them familiar with the whole production process. Countries including Sri Lanka, China, Taiwan, Philippines etc. reaped great benefits from introducing this type of training.

xiii. Introducing overseas training program on management, technological and vocational training for the skilled and core employees in the industry. (Example- Thailand) (World Bank, 2018)

xiv. Introducing training on computer programming, technical engineering, and design work so that we can work on product diversification and move to high value chain RMG products.

xv. Training the sewing machine operators is the most important part for this industry. As told earlier, other operators are recruited mostly from the existing sewing machine operators. Moreover, if the sewing machine operator is really good at his/ her job, he/she can take over the job of the quality inspectors (in many countries other than Bangladesh, there is no such category as “Quality Inspector” as their sewing machine operator does the job for them). If they are efficient and good, the sewing machine operators can ensure that other operators are doing their jobs properly and the end product’s quality is good. So, focus of training should be more for this category of RMG workers.

xvi. Factories can arrange for internship in this industry which would help them and the subsequently the industry to recruit newer people from the fresh graduates. For doing this, government could provide the factories with their internship fund, which could in turn help them to solve the problem of ‘Educated Unemployment’ to some extent.

xvii. As women workers face the dual burden of factory work and household activities, it becomes difficult for them to participate in training programmes that are organized after office hours. Therefore, potential women workers should have the opportunity to take part in training porgrammes during working hours (with no implications on their salary).

xviii. When a factory is working in a full employment capacity, upskilling of the existing workforce can be useful. And so, government can fund for the training of the existing operators and mid-level employees to mitigate the problems of turnover rate of employees (shifting to and from factories and retiring from factories).

Construction Sector

During the pandemic situation, supportive measures need to be put in place to ease the process of migration and foreign remittance receiving facilities for the migrant's families. Government policy should be established to uphold the interests of migrant workers who are staying overseas and who have returned to Bangladesh and to provide diplomatic support to ensure that more migrant workers can go abroad once the situation improves.

In short, what needs to be done for the development of the sector include, among others, are the following:

- Need to provide better packages to the workers (salary, other benefits)
- Skills training is essential
- Providing salaries based on skill and performances
- Timely payment
- More training institutes with state-of-the-art instruments
- Hands-on training
- Need to have proper policies for salaries, wages and benefits for the sector and proper implementation of it
- Need to improve the working condition and safety measures in the construction sites
- Need to provide accommodation and health support
- Need to have training institutes at the district level
- Number of Govt TVET should be increased
- Training with modern technology
- Need to have proper policies regarding development of the sector
- Need to have proper monitoring of policies and regulations also
- Need to provide due support for the development of the sector
- Need to protect the interest of the clients also
- Need to have better coordination both within (within the industry) and between (between the industry and the government, etc.

Hotel and Tourism Sector

All the stakeholders, viz., the policymakers, the enterprises, the (potential) employees, and the training institutions must play their proper roles to revamp the sector from the current malaise. While some of these imperatives may be achieved in the short-term, many of them need medium- to long-term actions through judicious planning. Failing to accomplish these imperatives would at best keep the sector alive but would not make it thrive. Some of these imperatives include:

The policymakers need to implement the existing Labour Act and the associated Rules and Regulations to mitigate low payments to the employees and low security of their jobs through

written formal contracts, employment benefits, and paid and unpaid leaves as articulated in the relevant acts, rules, and regulations.

Even though the classification of a hotel or resort is determined and registered as per the guideline of the UNWTO; the hotels and resorts do not always publicize their actual classification in terms of “star”. Moreover, the criteria for classification are not regularly upgraded. The government and respective agencies should take necessary actions to upgrade the classification criteria; monitor the status of each registered hotel and resort in a definite time interval and regulate the hotels to follow the upgraded criteria as well as to declare the actual classifications.

At present licensing and approval of high-ranking hotels and resorts are entrusted with the Ministry of Civil Aviation and Tourism and the job is delegated to the Deputy Commissioners (DCs) of the respective districts. This practice is likely to be susceptible to inaccurate licensing unless the DCs should at least have some discussion with tourism entities such as the Ministry, or the Bangladesh Tourism Board. A position in the Board may be created at the district level where an administrative officer will be entrusted to handle tourism-related activities locally.

The regulatory part in this industry is very weak. There is no entity to ensure the quality and standards of investments in the industry. Getting access to the HTS industry in terms of opening up new enterprises only requires adequate finance and does not necessarily need any prior qualification or experience in the sector. Hence, the current practice must be regulated.

There is ample scope to attract tourists from all over the world. Bangladesh has the longest sea beach in the world which can be fully utilized to host tourists from over the world. For example, the sea beach of Cox’s Bazar can be well organized for a worldwide surfing competition with the assurance of a proper foundation of infrastructure and security. However, infrastructural development and ensuring the safety and security of international tourists stand as a necessity. Once the twin issues are resolved, the tourism sector is likely to have a boom within a few years.

Nursing Sector

i. Recognition of the role played by nursing profession should be the corner stone to mitigating skills shortage

Nursing - caring for the sick and vulnerable, the center of humanity is amongst very few professions which remained consistently at the heart of the society ever since its inception. Nurses are critical to deliver on the promise of “leaving no one behind”, and global effort to achieve the Sustainable Development Goals (SDGs). The responsibilities of a nurse include promotion of health, prevention of illness, and the care of ill, disabled and dying people. Advocacy, promotion of a safe environment, research, participation in shaping health policy and in patient and health systems management, and education are key nursing roles. Improved pay structure, greater independence allowed in discharging duties, and strengthening in collective bargaining position made positive waves.

Services rendered by different professional groups in the health care sector – doctors, nurses, technician and the alike, are complementary to each other irrespective of relative importance and responsibilities and should provide the basis of appreciating respective role and need for professional up gradation towards a stronger and productive team. Nursing has now evolved into independent enough authorized to prescribe to patients themselves.

ii. Utilization of existing institutional facilities

Achieving fuller and proper utilization of the existing nursing training facilities in the country shall be the first policy option for the government. It involves reckoning existing facilities under all different sectors – government, private and non-government, appraising respective enrollment capacities, and making sure that no capacity remains unfilled Equally important is appraising all various factors hindering fuller capacity utilization and resolving them to the maximum. Moreover, the introduction of multiple shifts – day and evening, with necessary support services, would easily enable a greater enrollment level. Economies of scale could be achieved through maximum utilization of existing facilities.

iii. Improvement of the quality of nursing education

Improvement of the quality of existing nursing training should have the highest policy priority. Two particular aspects of quality improvement should receive much attention. First, passing out rate in nursing education has been very low which is significantly underlined by the quality of various services provided – infrastructure, faculty, practical training, etc. Secondly, quality of training provided in terms of coverage of course curriculum, adaptation of syllabus with changing needs especially changes in nursing profession, exposure to modern training methods, tools and instruments, could greatly improve the marketability of nursing graduates. Combined together, these will contribute to greater passing out rates, market value of graduates, therefore, motivation to continue with the profession. Quality improvement in nursing training shall focus, among others, on updating course curriculum, improvement in quality of teaching, standardization of training across different institutional setups – public, private and NGOs, set standards for the provision of various facilities in different nursing colleges and institutes, proper monitoring of existing training facilities, and ensuring proper accountability for training and monitoring of institutions.

iv. Cooperation and collaboration among different sectors

Ensuring higher nursing training quality – and its uniformity across different sectors, will require a greater degree of cooperation and collaboration among training institutes representing public, private and non-governmental organizations. Such cooperation and coordination shall build upon the quest for higher quality and uniform standards based on agreements on the possible determinants of quality education. An advisory committee representing all different stakeholders shall particularly focus on academic syllabus, teaching and training materials, evaluation standards, compliance with agreed norms and standards, and provisions for recognition for high achievers.

v. Specialized training for nurses

Skills gap for nurses with specialized training is an issue which needs to be reckoned and dealt with immediately. The number of registered nurses with specialized training is most minimal compared to the country's stock, and their annual supplies most minimal. For instance, there were only 206 nurses in the country with specialized training in Cardiac and Intensive care, 32 in Ophthalmic, and 34 in rehabilitation, as of 2016.

This is compared to a total of 50,000 nurses and 70,000 doctors – as 2019. One serious stumbling blog in this respect, among other factors, is supply constraint. There are only 20 seats available for such trainings in CCU, ICU or Cardiac, and trainings are available only in National Heart Foundation located in Dhaka. However, changing morbidity patterns, number of patients suffering from such diseases, and overall doctor patient ratio – not to mention, population – doctor ratio in particular areas of specialization,

There is, therefore, an immediate need to increase domestic capacity to train specialized nurse in the country. Two particular aspects of increased domestic supply of specialized nurses should be critical: First, exploring the maximum potential of any existing training facilities for specialized training in the country. The number of training slots available should be utilized to their most. Secondly, new specialized training facilities shall be created with immediate effects. While creating new facilities particular focus should be on locating such training in organizations having their need as also scope for practical training in specialized areas. Specialized nursing training for Cardiac related training could be located as in National Heart Foundation. Similarly, specialized training for Burn treatment could be located in the Burn Hospital; Neurology in, in National Neurological hospital.

Such locations will be beneficial both in terms of availability of teaching staff and scope for practical training. However, all efforts should be made to create specialized nursing facilities distributed across the country as per possible. This will help the growth of respective supplies at different geographical locations. Overall, five critical factors shall underline greater facilities for specialized training for nurses in the country: (i) identification of the type of specialized trainings required, (ii) setting a target number of nurses to be trained, (iii) phasing out of total training needs over different time periods, (iv) selection of location for specialized nurses training, and (v) strategies to materialize the planned objective.

vi. Incentive package for specialized training

Building institutional facilities apart, policy emphasis should be laid on motivating and facilitating greater interests among nurses to undertake specialized training in different fields. This will underline issues such as importance attached to specialized education and training for nurses reflected in professional recognition, institutional requirements, higher wage and salary, job mobility, involvement in decision making, etc.

Motivation for specialized training shall further involve cost-sharing among different stakeholders – particularly for working nurses seeking specialized training. This would involve sharing of the costs of training – by trainee or employer, partly or fully, with or without any string attached. Moreover, there would be questions about specialized training on a part-time basis – evening classes, or full-time. Full-time studies may involve issues of leave from current employer including provision of salary and benefits during training.

Participation in specialized training on a full-time basis underscores issues like costs of training – subsidized or otherwise, provisions of financial aids – scholarships, waivers, provision for student loans, sponsorship, etc. A greater priority on specialized training could aim at motivation alongside redeeming the burden of the costs of education and training. Future job prospects – in terms of market demand, or associated benefits would be important motivational factors.

vii. International demand for nurses

Catering to international demand for nurses will involve particular focus on certain aspects of nursing training in the country besides ensuring international standard. Unlike homogeneity of the domestic market for nurses – language, culture, manners, etiquette, disease profile, international market conditions would be most diverse and dynamic.

International demand for nurses, unlike the domestic, the importance of particular issues such as (i) language barrier, (ii) quality of training, (iii) exposure to latest technology, (iv) independence, and (v) team play. Proficiency in local language is must to provide healthcare services in any parts of the world. English is an international language spoken in many countries. However, the level

of proficiency required shall be of high order. Similarly, quality of nursing education will need to be attuned to an international standard. Particularly important here are enabling nurses the expertise, experience and confidence to work independently, take important decisions, and be an active member of the team.

Special policy focus shall, therefore, be on international marketability of nursing training in the country. Understanding of the global market for nurses shall be complemented by creation of institutional facilities geared in this direction. Modern nursing training facilities, course curriculum with a global perspective, exposure to modern tools and techniques, including information technology, knowledge of socio-cultural differences across countries, etiquette and manners dealing with patients, doctors, independent decision making, working as a team player, etc. are some of the relevant issues for global marketing of nurses.

Proper evaluation and certification of trainees is vital to global marketing of nurses trained at home. Planning, monitoring, and evaluation by international professional team could be an important policy strategy. Similarly, collaboration with domestic hospitals for practical training facilities, supervision of experts in the respective areas, performance monitoring by expert groups will be critical to ensuring the quality and standard of training.

Collaboration with prospective international employers of nurses will prove effective in creating overseas demand and ensuring domestic supplies. Local nursing training institutes could cooperate in this respect towards mutual benefits. Cooperation could be in terms of transfer of required knowledge and experience in exchange for creating overseas job opportunities.

Shipbuilding Sector

Shipbuilding Industry is an important economic and growing industrial sector in Bangladesh. However, despite being marked by the government as a strategic industry for growth, the shipbuilding industry has not yet been meeting performance expectations. A slowdown in the global economy combined with infrastructural limitations have restrained the growth of industry. At present in the absence of backward linkage facilities, most of the accessories are imported, and the manufacturers are only able to retain the labor costs and shipyard profit. Bangladesh has the potentiality to revolve into a hub of shipbuilding in the global context for small and medium-sized vessels within short time. This study has provided estimates of demand for skills at present and arrived at some projections for next five/ten years. The study discussed the issues like comparative changes in employment, job growth (+)/ loss, extent of formality, desired occupation, extent of difficulties in filling out the vacancies, skill shortage, skill gaps etc. to understand the situation. It has also discussed the role of the existing training system in meeting the skills requirements of the country. The survey of shipbuilding firms also indicates that there are a number of skills gaps in workers from different occupations in shipbuilding sector and these findings necessitate as well as accentuate the importance of educational attainment for filling up the future occupational job vacancies. This finding also accentuates the skill shortage in the shipbuilding industry. Based on the study findings, we recommend that the government take the following measures to address the skills constraints in the shipbuilding sector.

i. Set up specialized institutes/training centre to train entrepreneurs/workers on for producing international standard ship products.

ii. Improving linkages between TVET and enterprises and also with different institutions (training, research and academic) and establish high-level coordination platforms in this regard.

iii. Supports for backward linkages of the industry and incorporate skills training relevant to market needs through involving the private sector in institutional management.

iv. Incorporating steps to encourage technological advancement for sustainable development of the industry as automation is an important factor.

v. Integrate shipbuilding expansion plan as strategic development programme of the country and the sector needs a favorable regulatory framework to support the industry.

vi. Improve its employee benefit scheme such as: performance bonus, festival bonus and medical allowance as these allowances can motivate employees.

vii. Create a strong and active pool of trainers through arranging proper ToT (training of trainers) programs. This could be performed by providing support to appropriate institutions to arrange local and foreign ToT training on a regular basis. Foreign experts could be invited as trainer in these training programs.

viii. There is a huge investment opportunity in this sector (ship-building, ship maintenance and repair services, supply of parts, components and fittings etc). So, investment in the sector should be increased and public-private partnership can be arranged in this regard.

Labour Market Study under Skills for Employment Investment Program (SEIP)

Skill Gap in the Furniture Sector of Bangladesh

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Abbreviations and Acronyms

KIIs	: key informant interviews
BFIOA	: Bangladesh Furniture Industries Owners Association
SSC	: Secondary School Certificate
GDP	: Gross Domestic Products
TVET	: Technical and Vocational education and Training
ICT	: Information and Communication Technology
KII	: Key Informant Interview
MDF	: Medium Density Fiber Board
SMI	: Survey of the Manufacturing Industry
GoB	: Government of Bangladesh
ILO	: International Labour Organization
BBA	: Bachelor of Business Administration
B.Sc	: Bachelor of Science
GIZ	: Deutsche Gesellschaft für Internationale Zusammenarbeit
NTVQF	: National Technical and Vocational Qualification Framework
CNC	: Computer Numeric Control
CAD	: Computer-Aided-Design

Executive Summary

Furniture is a rising industry in Bangladesh, as domestic and foreign demand has increased in recent decades as a result of official and corporate use of furniture. Furthermore, domestic consumers' purchasing power has expanded as a result of economic expansion. The rapid growth of this industry is driven by the rising demand for furniture from both domestic and international markets. The limited labour supply and shortage of skilled personnel, however, make it difficult to realize the full potential of this sector. To overcome this hurdle, the productivity of the labour force must be improved through effective education and skill development in order for the country's future progress to be achievable. This necessitates a thorough analysis of demand and supply, as well as the current state of the skill, in formulating a strategy for skill development over the medium and long term. This study explains the future labour supply-demand gap, as well as the training required in the number of employed people to achieve higher growth in this industry, as well as demand and supply projections for 2035. It provides estimates of training targets to be considered under SEIP.

The purpose of this study is to project future labour supply and demand in the furniture industry, as well as the number of people who will need to be trained. The paper is qualitative in nature, and there isn't much scope for quantitative analysis in this paper. However, the paper primarily uses secondary analysis in a few cases, namely the 2016-17 labour force survey. The analysis of how much labour would be employed by 2035 assuming the current pattern of value addition in the manufacturing sector continues is used to make the labour supply projection. According to the forecast, labour employment in the furniture business will double by 2035, compared to the 2016-17 LFS figure. The labour need is forecasted using data from key informant interviews (KIIs) and the Bangladesh Furniture Industries Owners Association (BFIOA). The furniture sector has unmet demand; qualitative responders suggest that if the industry could meet the unmet demand of labour, it might grow at a rate of 10 per cent per year on average. As a result, there is an average 3.5 per cent supply and demand mismatch in the furniture industry, which will persist until 2035 if effective labour supply measures are not taken. Additionally, if we project the data based on the growth of value addition elasticity of employment, which is. 28% in 2013 to 2016-17 LFS, the labour demand coincides with the demand satisfied under the meeting "unmet demand."

Along with the unmet demand in the furniture industry, there is a skill gap, a lack of female employment, and a low number of people who have received training in this field. Based on the qualitative responses in this study, a training projection is provided for this sector. Despite the fact that the furniture industry is mainly informal in character, providing training to them would be less effective. Thus, formal furniture industry workers should be given training, with a focus on the export-led industry. Production-related workers, notably carpenters and mid-level operators, must be given training. The training should last at least six months and training should base on the understanding of the output of modern technologies utilized in the furniture industry. Based on a study of the KIIs and other pertinent data, an estimate of the training required in this industry has been made. The projection shows that, on average, the industry will need to provide training to 5 per cent of employed people each year until 2035. The training is very important in the sections of the machine operator and finishing in large industry and carpentry, and lacquer (designer) in small and medium industry.

The projection is entirely based on the 2016-17 labour force survey, KIIs, and discussions with the BFIOA, as well as the trend in the value-added of this sector. How much value addition and KIIs information is realized will determine the usefulness and validity of the estimated projection. These figures should be regarded as tentative estimations, as many of the assumptions may no longer be relevant after another 5-10 years, requiring re-projection.

An important function that industry links can play in reducing skill mismatches is in the reduction of skill mismatches. Industry can assess sector growth and, as a result, revise the projected training need. More emphasis should be paid to the practical aspects of establishing such relationships. The most significant channel for developing such a link will be industry associations. The BFIOA can play a role in bridging the gap between the SEIP and industry. Additionally, establishing a centralized training centre in partnership with the SEIP and the BFIOA may provide a coherent framework to reduce the skill mismatch issues.

Since a large portion of the workforce has less than an SSC level of education, their training needs must be considered, and special training modules must be developed. The training must be aligned with the providing of basic education as well as the introduction of the output of the machine in furniture production. In light of the current distribution of women's employment in the furniture business, the need to attract more women into the industry requires special emphasis. For this, women should be given priority for training in skilled development.

Research and development should be prioritized, and the establishment of a furniture village might be a means to expand the sector, simultaneously generating economies of scale and external benefits from capital accumulation.

1. Introduction

1.1 Background and Context

The documented history of the furniture sector in Bangladesh goes back to the sixties. Before that, the industry was a cottage-based one. However, since the nineties, the industry set its foot in the global market and since the 2010s, the sector is being growingly considered one of the emerging industries in the country. The sector has been contributing to the country's industrialization and poverty reduction by rising GDP, creating employment, and consistently increasing export revenue in the recent decade. Industry experts think that the sector has immense scope to grow; especially in the context of consistent growth in the international market, as the market volume of world furniture has doubled from 2000 to 2021 (CSIL, 2021).

The rise of the furniture industry in Bangladesh is fueled by demand derived from the rising per capita income and corresponding standard of living of the population, as well as demand derived from a competitive cost advantage in the worldwide market. The abundant and relatively cheap labour supply in the furniture sector has been a vital factor in becoming globally competitive. Having recognized its export prospects, the furniture industry has been declared a 'thrust sector' and is included as one of the highest priority sectors in Bangladesh's Export Policy 2018–2021.

However, increasing the sector's share in the global value chain requires special attention to the potential and the challenges of the sector, rather than treating the sector on an ad-hoc basis. For instance, domestic manufacturers require to diversify the products basket with innovation to meet international demand. The quality of the labour force, or skilled manpower, is a prerequisite to realising the potential of this labour-intensive industry, among other key factors of production. The sector being highly informal, there are very few studies or secondary data available regarding the detailed employed labour force scenario, which is crucial for evidence-based policymaking and providing required institutional support to the sector. Against this backdrop, this study intends to conduct a skill gap analysis of the employed labour force of the sector.

One study on the existing skills gap in the furniture sector (CTI, 2017) found that, in the "large and medium" firms, the major shortage of skills is managing self-development, technical and core skills, computer literacy and knowledge of ICT, and numeracy skill. In "small" firms, the major shortage of skills includes computer literacy or knowledge of it, technical and core skills, managing self-development and literacy skills. Additionally, lacking leadership skills, team management, communication skills, and problem-solving skills have been observed in the study irrespective of firm size. However, the study solely specifies the quantitative characteristics of the skilled shortfall in the furniture sector and assesses the soft skill (team working, computer literacy etc.) gap; while the study briefly touches on the qualitative structure of the labour market in the furniture sector and no discussion on the hard skill of workers (education, experience and training), and the overall skill gap in this sector has not been recognized. Furthermore, the study does not address whether our current labour market skills fulfil labour demand, or whether our existing education system and technical and vocational education and training (TVET) prepare workers to mitigate the furniture

industry's skill shortfall. A series of studies are required to determine the causes of the labour shortage and to determine where, how, when, and what types of skill development programs should be implemented to increase labour skills in the furniture industry. This study employs a qualitative approach by interviewing prominent furniture industry executives to document and assess their perspectives to evaluate the present skill gap in the furniture industry so that training and development programs can be implemented.

1.2 Objective

Considering the importance of the furniture sector to the economy of Bangladesh and the importance of skills for the persistent growth of this sector, the present study seeks to examine the skill of the furniture of the country. The specific objectives of the study are the following:

i. To explore whether there is an imbalance between the desired level of education, experience, and training and the actual level of education, experience and training for different occupations.
ii. To identify the shortage of skills demanded by employers and skills provided by furniture workers
iii. To analyze the occupational composition of the furniture sector, particularly the gender composition of employment
iv. To identify future talent requirements for the furniture industry over the next decade, as well as skill requirements for the fourth industrial revolution.
v. To suggest recommendations to implement the occupational wise training program for improving the skill level in this sector

1.3 Overview of the report

The report attempts to cover two aspects: first, it examines the furniture sector's potential, and future potential, and second, it analyzes the existing skill gap in the industry and the training needed. With this, we begin the report's introduction by emphasizing the subject of the furniture industry's overall status and the current challenges it faces in dealing with the skills gap. The methodology and conceptual framework for the report are discussed in the next section. The qualitative response is conducted through a key informant interview (KII), and constraints and obstacles encountered during the KII are included in the methodology. Terms and conditions and strict protocols were maintained at the time of KII. In addition, a conceptual framework is included to ensure that the qualitative responses are collected systematically.

In the next part, the reports go over a sectoral overview. The overall situation of the furniture industry in both domestic and international markets, its value addition to total value-added, the share of furniture in GDP, export and import of furniture, employment generation, male-female employment composition, and occupation composition in the furniture sector are all included in the sectoral overview. The findings of the qualitative response are covered in the next section as a continuation of the report. It's split into two sections. The first step is to present the occupational structure as suggested by the qualitative response. Second, as the

interviewee's concerns and suggestions, the findings of the skill gap, skill shortage, and skill mismatch are presented in priority order.

The report's last section makes policy recommendations for raising the general skill level of the furniture industry. Based on the qualitative response, a recommendation and approach for closing the skill gap are suggested. Finally, the report's summary and a path forward for future research are provided.

1.4 Conceptual Framework

The questions asked of each respondent were designed to assess the furniture sector's skill imbalance. As distinct ways of processing and presenting information, skill is classified into three categories: skill gap, skill shortage, and skill mismatch (horizontal and vertical). We have followed this path and categorized the questions accordingly. We didn't try to measure skill level because we were doing a qualitative response, rather we wanted to know how the firms perceived skill level.

1.4.1 Skill gap

It is the employer's opinion of employees at the firm's level as to whether or not workers are capable of doing their relevant tasks and duties if they lack the necessary skills. This type of skill disparity could result in reduced productivity per worker, higher labour costs, higher recruitment and training expenditures, and a negative impact on company profitability.

1.4.2 Skill shortage

It is a circumstance in which a company finds it difficult to fill a vacancy with qualified labour. Firms are compelled to fill vacancies with unskilled personnel if they are unable to reach the requisite level of ability. This issue is also known as a mismatch between the abilities required by employers and the actual skills provided by employees.

1.4.3 Skill mismatch

Skill mismatch arises when there is a difference between the desired level of education and the actual level of education among the employees. If an employer is offered a position that is unrelated to their degree, abilities, or knowledge. It is also known as a Horizontal mismatch. On the other side, a vertical mismatch occurs when the education necessary for the work falls short of the actual degree of education of employees. The goal of this skill level categorization is to determine the general skill imbalance in the furniture business and to provide the findings from interviews in a more detailed way.

2. Methodology

In line with the qualitative nature of the study, two complementary approaches were adopted by the research team: (i) Desk Research and (ii) Key Informant Interviews (KII). The desk research focused on the existing literature and policy documents. The KIIs were conducted with industry insiders.

2.1 Desk Research

Extensive desk research was conducted for the study. The desk research focused on existing literature on trend analysis on key indicators of the furniture industry and institutional frameworks in support of the industry. In this regard, literature on market trends, labour force composition, skill demands and skill mismatch were reviewed. Government policy documents including general policies on industry and export and industry-specific policies were assessed thoroughly.

2.2 Key Informant Interview (KII)

Apart from the desk review, the study uses a qualitative approach to determine whether there is a skill gap in the furniture industry. As a result, key informant interviews (KII) have been conducted with some of the country's most notable furniture owners to better comprehend and answer the research questions. Key Informant Interview (KII) is an essential tool for comprehensive qualitative research. A systematic approach was followed in arranging and implementing the KIIs. The KIIs were aimed at investigating the industry stakeholders' perspectives on the skills gap in the furniture industry. The senior-level executives have the experience and therefore insights on the skill level of the currently employed workers of the industry and also the aspirant candidates, as anticipated by the study team. Furthermore, the questionnaire also looked into the areas which appeared crucial to the study team during the desk research.

The interview was conducted in person, each consisting of thirty to forty minutes, over three weeks in 2021. Due to the pandemic, the majority of the interviews were performed using various online platforms, including Zoom and WhatsApp. For the sake of maintaining confidentiality, the terms and conditions for the interview were carefully prepared and strictly adhered to. None of the interviews was digitally recorded, and the interviewer was only allowed to transcribe manually. The written content was analyzed to prepare the findings and recommendations. Table 2 shown in Annexe 1 details the background of the interviewees as well as the size of the firms they represent. Aside from the KIIs, the study team spoke with the chairman of the Bangladesh Furniture Industries Owners Association (BFIOA) and other important stakeholders connected with the association.

2.3 Basis for the projection

The researchers used a variety of methods and technic to estimate the furniture sector's future taking into account its current potential. When working with time-series data, such as value addition and export earnings from the furniture industry, a linear projection is applied based on data from the previous period. Linear projection embodies the trend of a specific variable and projects the future period while taking into account all changes made happened previously to the data. The macro-level analysis provides time-series projections of labour supply and demand by sector. On the labour supply side, employment in the furniture sector in the labour force survey 2016-17 is used; generally, the number of people will be absorbed into the furniture sector based on linear projections of this sector, such as value addition, GDP contribution, and domestic demand growth. To see the distribution of labour employment in the sector, the quarterly labour force survey 2016-17 and the manufacturing survey 2019 are

used. On the other hand, demand-side estimates are based on data from the Furniture Owners Association (BFIOA) and other relevant key stakeholders and growth of value edition elasticity of employment in the furniture sector, with domestic growth being considered given the sector's present potential. It may, however, be mentioned that the scope of the study is rather limited. Since the latest LFS was conducted in 2016-2017, all analyses are based on this. The validity and usefulness of the projections of training targets will depend on whether the assumptions of the value-added growth of the furniture sector are realized.

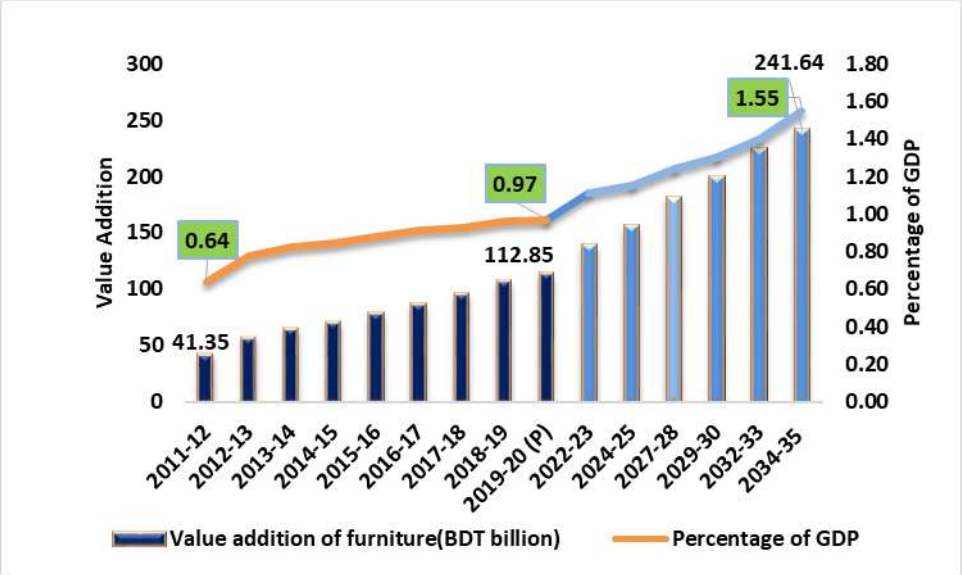
3. Overview of the sector

While the furniture industry is now being acknowledged as an emerging sector, the process of transforming furniture into a potential one began many years ago. Due to the abundance of wood, Bangladesh has traditionally produced artistic and crafted wood furniture, as well as cottages with wood. The early development of the furniture industry was aided by the increasing demand for cottages. The industry has evolved from cottages and small-scale woodworking activities carried out at home to mechanized mass-scale production and a medium-to-large-scale commercial industry[1]. The modern furniture industry began to grow using modern machinery, diverse materials, and new designs. Modern furniture is also distinguished by the use of materials other than wood; the most common types of furniture are made of wood, processed wood, melamine board, Medium Density Fiber Board (MDF), particleboard, steel, and leather[2]. Despite the continuing transformation process from craft manufacture to machine-based manufacture, so far, the sector remains relatively labour-intensive. The industry is dominated by micro, small, and medium firms with a few large firms, located in different places across the country. In 2014, there were more than 71000 firms, of which less than 100 firms fall in the large and medium category, and the rest are micro and small firms (Akter, 2014). According to another source, the number of firms was 75,000 (IDLC, 2014). Its labour-intensive nature has aided in this rapid growth, reaching about 80000 micro, small and medium enterprises in 2020 according to informal sources[3].

The furniture industry's contribution to gross value addition is increasing over time[4]. The sector’s gross output stands at USD 103444.65 billion, which is 0.91 per cent of the total gross output in 2018. The average growth of value added is 13.69 per cent from 2011-12 to 2019-20, the average growth of export is 14.90 per cent from 2010-11 to 2020-21. The overall value-added of furniture manufacturing in Bangladesh was BDT 112.85 billion in 2019-20, up from BDT 41.35 billion in 2011-12 (Figure 1). As a result, its net contribution to GDP in 2019-20 is expected to be over 0.97 per cent, up from 0.64 per cent in 2011-12. The growth of value-added to furniture is larger than the growth of the gross domestic product; the furniture sector's value-added growth was estimated at 12.19 per cent, while GDP growth was estimated at 8.15 per cent in 2019-20. The value addition of furniture is expected to more than double in fifteen years, from BDT 112.85 billion in 2019-20 to BDT 241.64 billion in 2034-35, according to the linear projection.

[1] https://bdbanijjo.wordpress.com/tag/leading-furniture-industries/
[2] https://www.thedailystar.net/an-overview-of-bangladesh-furniture-industry-6612
[3] https://www.tbsnews.net/economy/industry/future-burns-bright-furniture-38827
[4] Each data calculated for furniture value addition is inflation adjusted (2005-06 constant price)

Figure 1: Value addition of furniture and percentage share in the GDP



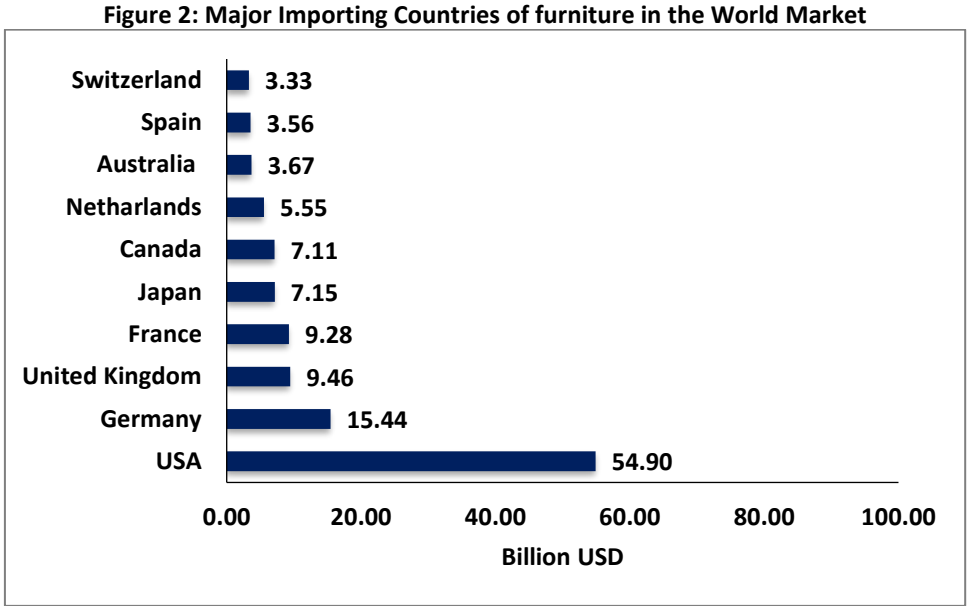
Source: Statistical yearbook Bangladesh 2020, BBS

The share of furniture on total value addition in Bangladesh has been expanded due to a rising middle-class population leading to a thriving real estate business, corporate institutions and rising urbanization. This demand was formerly supplied by imported furniture from Malaysia, India, and Thailand[5]. Domestic producers, on the other hand, have recently been able to grab the bulk of market share by creating high-quality finished items. Thus, 93 per cent of manufactured furniture is sold in the local market[6]. As a result, the local furniture industry is expanding at a positive rate. There are only a few sources for information about local furniture sales. Only three studies have been conducted so far regarding furniture sales in the domestic market. The domestic market for furniture sales is estimated to be worth USD 840 million (EU, 2013). In 2017, the Center for Trade and Investment conducted a survey on furniture sales in the domestic market, finding the value at USD 870 million. Moreover, various informal sources have confirmed that the domestic market is now growing at an 18- 20 per cent rate annually[7].

Globally, USA and China are the key drivers of the international furniture trade. The total value of furniture imports is USD 183.87 billion (UN Comtrade, 2019). The leading importers are the USA (29.9 per cent), Germany (8.4 per cent), the United Kingdom (5.1 per cent), France (5 per cent), and Japan (3.9 per cent) (Figure 2).

[5] https://databd.co/profiles/industries/profile-timber-and-furniture/
[6] https://www.tbsnews.net/economy/industry/future-burns-bright-furniture-38827
[7] https://www.tbsnews.net/economy/industry/future-burns-bright-furniture-38827
p stands provisional

Figure 2: Major Importing Countries of furniture in the World Market



Source: International trade statistical yearbook (2019)

The United States, Canada, China, Nepal, Bhutan, the Middle East, Malaysia, and the European Union, on the other hand, are Bangladesh's top furniture importers. The most common items exported are wooden furniture (HS 940360), metal furniture (HS 940320), plastic furniture (HS 940370), parts of furniture (HS 940390), wooden furniture of a type used in the bedroom (HS 940350), metal and metal furniture of a type used in offices (HS 940350) (EPB, 2022).

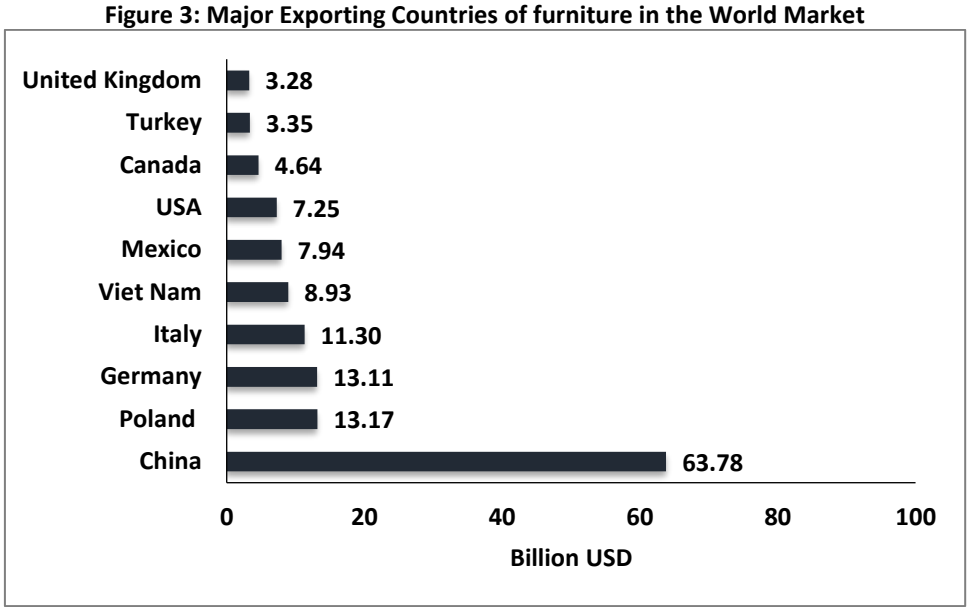
Bangladesh imports finished furniture as well as parts or raw materials. Furniture imports to Bangladesh are highly unpredictable, fluctuating from year to year. One interpretation of furniture import volatility is high import duty. Raw material import duties range from 37 per cent to 89.32 per cent, including value-added tax and advance income tax[8]. Its expected growth trajectory indicates a desire for raw materials by the domestic industry to meet domestic demand and export to other countries. Import of furniture and raw materials in 2019-20 stands at BDT 1.9 billion (Figure 3), up 1.54 per cent from 2018-19. Raw materials, however, account for the majority of imports. Raw materials or furniture-related parts account for 60 per cent of all imports, according to the Bangladesh Furniture Owners Association (BFIOA). Imported raw materials include timber, wood finish materials, hardware and accessories, and high-quality textiles (BFIOA, 2021). China, Germany, Italy, Indonesia, and the United States are Bangladesh's top import markets[9]. If manufacturers can be less reliant on imported raw materials, Bangladesh can produce furniture at a lower cost and realize its export potential. Therefore, industrial experts recommend cutting import tariffs or taking other steps to ensure the domestic supply of raw materials.

The market volume of the worldwide furniture industry was about 500 million in 2020 while the total furniture export in the world is USD 190.75 billion (Un Comtrade, 2019). Around 40 per cent of the global share of furniture is possessed by China. The five leading exporting

[8] https://online.thedailystar.net/business/export/news/high-import-duty-hinders-furniture-export-2941476
[9] https://databd.co/profiles/industries/profile-timber-and-furniture/

countries are China (33.4 per cent), Poland (6.9 per cent), Germany (6.9 per cent), Italy (5.9 per cent) Viet Nam (4.7 per cent) (Figure 3).

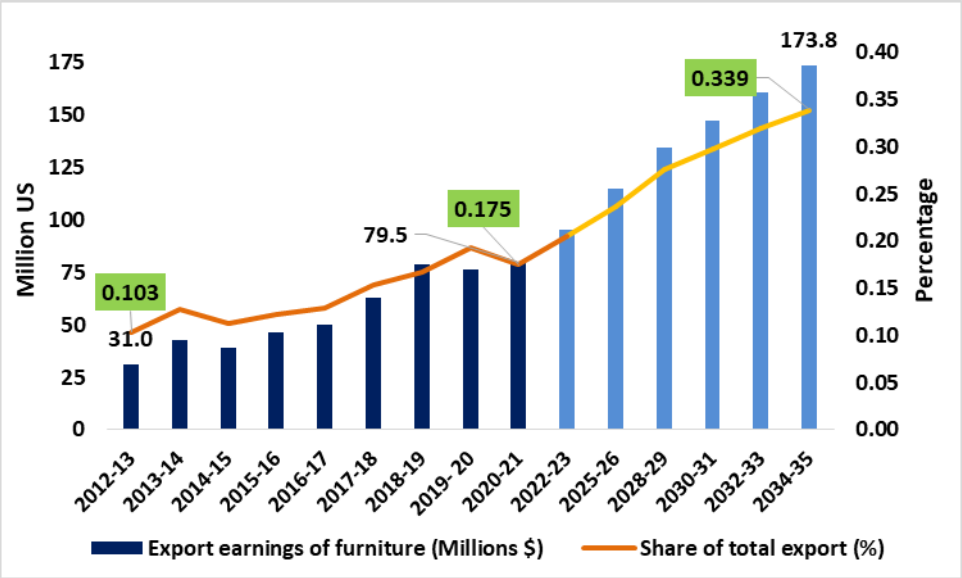
Figure 3: Major Exporting Countries of furniture in the World Market



Source: International trade statistical yearbook (2019)

Bangladesh has achieved persistent growth in furniture export over time. This industry is the country's fastest-growing export industry. Till now, Bangladesh's share in the world market is negligent. However, Bangladesh's share in the global furniture market is increasing, from 0.02 per cent in 2014 to 0.03 per cent in 2017 (Jalil et al., 2017; Razzaque et al., 2019; BFIOA, 2019). The share of furniture export relative to total export is 0.2 per cent in the 2020-21 fiscal year recording export earnings of USD 79.5 million (EPB, 2022). However, Bangladesh has also experienced negative export growth at times, for instance, in FY2014-15 and FY2019-20 (Figure 4). The global exports of products fell in FY2015-16 due to the world economic slowdown, and global trade and international demand fell in FY 2019-20 as a result of the worldwide COVID-19 pandemic. Bangladesh has been able to bounce back and achieved a 4 per cent rise in export as the world trade has started to recover. If the current trend of export earnings continues, furniture export earnings will equal 173.8 million in 2034-35, accounting for.34 per cent of total earnings.

Figure 4: Bangladesh's Export Performance in Furniture Sector

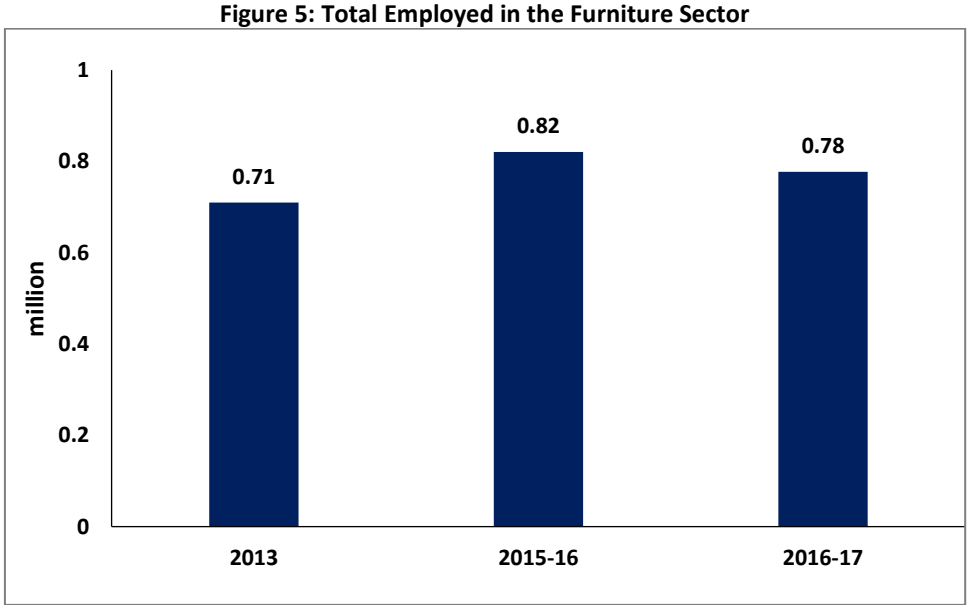


Source: EPB, 2022

China controls a sizable piece of the global furniture market and provides the highest quality furniture products to the global market, all of which are new and low-cost. Furthermore, the lower percentage of export to the worldwide market is due to high taxes on imported raw materials as well as a lack of variety to meet global demand and taste.

According to the 2016-17 labour force survey, total employment in the furniture sector is 0.777 million, and it ranks third among all manufacturing sectors in terms of job creation, after ready-made garments and textiles, with 9.41 per cent of total employment in the manufacturing sector for the country. Despite a 9.41 per cent increase in labour employment from 2013 to 2016-17 in the furniture sector, the quarterly labour force survey 2015-16 revealed that labour employment in the furniture sector was 0.821 million (Figure 5), which is greater than the figure of the following year. One interpretation of the decrease in labour employment is that the furniture sector is moving toward a high-machine-intensive manufacturing process with automation (Razzaque et al., 2019).

Figure 5: Total Employed in the Furniture Sector



Source: Labour Force Survey (various years), BBS

In the furniture industry, gender composition is largely male-dominated, with only 7 per cent of workers being female (Annexe 1.1). The gender composition in manufacturing in the last three available labour force survey reports indicates that the male was overcrowded in this sector. One optimistic view is that the 2016-17 data has a larger percentage of female employment in the furniture sector. The fact that the furniture industry requires a lot of manual labour could be one of the reasons for the low female employment rate. With the adoption of new technologies in this industry, a change in gender composition is plausible.

The furniture sector's total education level is indeed very damaging, with 43.88 per cent of employed people having just completed primary school and a substantial portion of the employed labour having no education, or primary school, or secondary school (Table 1). The employed labour has a low level of education as well as a lack of training, with 1.1 per cent of the employed person receiving the training, while 98.1 per cent do not. The employed with a secondary education received the most training, but the overall trained workforce in the furniture industry is highly negligent. The furniture sector needs to improve the situation in terms of receiving training. For this, education levels must be raised, as this will enhance awareness of the need for training. Higher education is set to increase the chances of receiving training, as evidenced by the fact that secondary educated workers have received higher training.

Table 1: Training and education level of employment in person in the furniture sector

Education level	Employment in thousands	Per centage	Whether received any training in thousands	
			Yes	No
No education	171.95	22.19	0.90	171.04
Primary	340.09	43.88	2.32	337.77
Secondary	236.25	30.48	5.09	231.16
Higher Secondary	16.16	2.09	0.36	15.80
Diploma	2.49	0.32	0.36	2.13
Tertiary	8.08	1.04	0.06	8.01
Total	775.01	100	9.09	765.92

Source: Labour force survey 2016-17

As advanced technology is adopted by the industry to satisfy the growing global demand, the skill level is becoming increasingly crucial in the furniture industry as well. Because the furniture industry is expected to develop advanced manufactured products, numeracy, IT, machine operating, and literacy skills would be in high demand (CTI, 2017). Table 2, on the other hand, depicts the skill level in the furniture industry, which is very low. Unskilled labour accounts for 66.07 per cent of the whole distribution, while semi-skilled labour accounts for 30.48 per cent, indicating that the furniture industry is dominated by extremely unskilled and semi-skilled labour with low education levels. Furthermore, among the skill levels, unskilled workers' participation in training is low; overall, 1.17 per cent of employed labour received training, indicating that labour is unskilled in terms of education and lacks training.

Table 2: Skilled level in the furniture industry

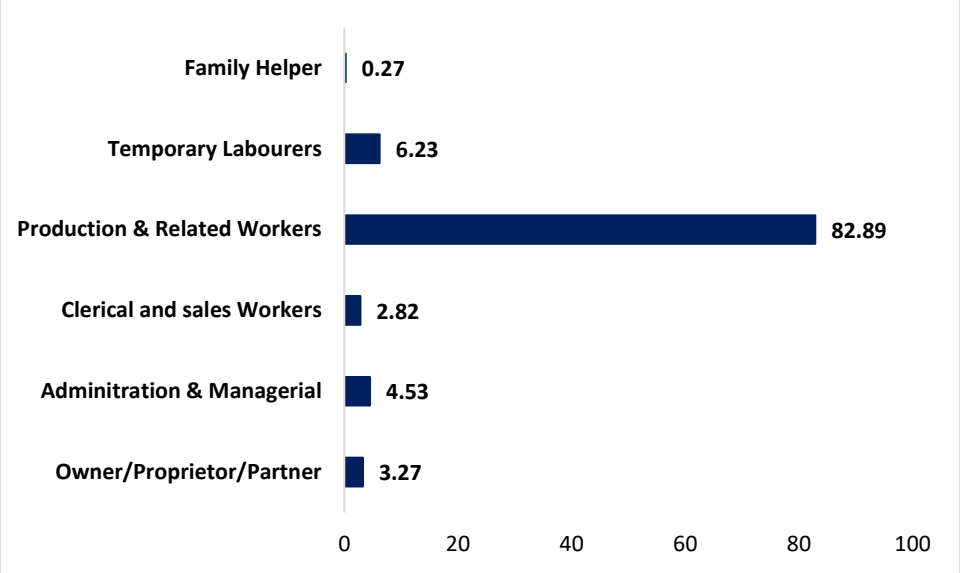
Skill[10] level	Number of people (Thousands)	Per cent	Whether they received any training (percentage)	
			Yes	NO
Unskilled	512.040	66.07	0.42	65.65
Semi-skilled	236.251	30.48	0.66	29.83
Skilled	26.723	3.45	0.10	3.35
Total	775.014	100	1.17	98.83

Source: Labour force survey 2016-17

The employee turnover rate in the furniture industry is fairly high. Among the tasks that the industry requires to be performed shaping, combining, polishing, and shining the wood. These tasks require a specific set of skills. Among the occupations required by the industry, the major portion is involved in production-related works. According to the survey of the manufacturing industry (SMI) 2019, around 82.89 per cent of labour works in production and production-related works. Due to the informal nature of the industry, it is common practice to temporarily recruit labour when there is a high demand for furniture in the market and vice versa, accounting for 5.58 per cent of the employed population (Figure 6).

[10] Skilled level is categorized based on the education attainment, Unskilled- no education to primary education, semi-skilled- secondary education and skilled- higher secondary to tertiary

Figure 6: Percentage of the occupational composition of the furniture industry



Source: Survey of Manufacturing Industry 2019, BBS

Bangladesh is a low-cost labour country, and the quantity of low-wage labour is the cause of Bangladesh's export potential in the furniture industry. Bangladesh's benefit from a lower wage rate is offset by the country's lower labour productivity. Bangladesh's average productivity is 10.4%, while South Asian and APO countries' average labour productivity is 16.3% and 27.8%, respectively (APO,2020). The lower average labour productivity indicates, on the other hand, the existing skill gap and shortage of skilled manpower in the labour force, including in the furniture sector. The government of Bangladesh (GoB) has set to target to reach a productivity growth of 5.6 per cent by 2030 at the national level.

3.1 Projection of labour supply and demand

The LFS 2016-17 survey has been used to predict total employment in this sector, while the SMI 2019 was used to project occupational composition. The projection shows the representation that if the furniture sector absorbs employment as per requirement in this sector. The forecast assumes that the furniture industry absorbs the workers as per as requirements of this sector. Table 3 depicts the industry's projected labour employment and occupational employment over time. If the current trend of the furniture industry's contribution to GDP continues, employment in this sector will be 2.18 million in 2035, up from.77 million in LFS 2016-17. Because the occupational makeup of the SMI 2019 survey is heavily skewed toward production-related workers, 1.80 million persons will be employed directly in production-related positions in 2035. Although we cannot disaggregate the occupational category more narrowly based on secondary data, in the qualitative survey in the following section, we present the occupational structure in a disaggregated manner and analyze based on qualitative responses. Temporary labourers, which will employ around.14 million people in 2035, are projected to be the second-largest absorption of labour. This illustrates the informality of this sector in nature. The most important necessity is to decrease the use of temporary labour because working temporarily in an industry reduces the industry's output.

Table 3: Projection of the employment in person of the furniture sector (Thousands)

Year	value addition (BDT Billion)	Total employment	Owner/ Proprietor/Partner	Administration & Managerial	Clerical and sales Workers	Production & Related Workers	Temporary Labourers	Family Helper
2017	86.44	777.273	25.393	35.184	21.885	644.281	48.411	2.119
2018	94.82	852.665	27.856	38.597	24.008	706.774	53.106	2.325
2019	106.39	956.662	31.253	43.305	26.936	792.976	59.583	2.608
2020	112.85	1014.789	33.152	45.936	28.573	841.158	63.204	2.767
2021	121.70	1094.386	35.752	49.539	30.814	907.135	68.161	2.984
2022	130.27	1171.424	38.269	53.026	32.983	970.992	72.959	3.194
2023	138.84	1248.462	40.786	56.514	35.152	1034.849	77.757	3.404
2024	147.40	1325.500	43.303	60.001	37.321	1098.706	82.556	3.614
2025	155.97	1402.538	45.819	63.488	39.490	1162.562	87.354	3.824
2026	164.54	1479.576	48.336	66.975	41.660	1226.419	92.152	4.034
2027	173.10	1556.614	50.853	70.463	43.829	1290.276	96.950	4.244
2028	181.67	1633.652	53.370	73.950	45.998	1354.133	101.748	4.454
2029	190.24	1710.690	55.887	77.437	48.167	1417.990	106.546	4.664
2030	198.81	1787.728	58.403	80.924	50.336	1481.846	111.344	4.874
2031	207.37	1864.766	60.920	84.411	52.505	1545.703	116.142	5.084
2032	215.94	1941.804	63.437	87.899	54.674	1609.560	120.941	5.294
2033	224.51	2018.843	65.954	91.386	56.843	1673.417	125.739	5.504
2034	233.07	2095.881	68.470	94.873	59.013	1737.274	130.537	5.714
2035	241.64	2172.919	70.987	98.360	61.182	1801.130	135.335	5.924

Source: Authors' estimation from LFS 2016-17, and Survey of Manufacturing Industry 2019

The data from the LFS 2016-17 reveals that demand and supply are in equilibrium. Furthermore, it depicts the sector's demand and supply conditions. We do, however, estimate demand based on information from various stakeholders and BFIOA members. In the furniture industry, there has been an unmet labour demand. Existing employment (on the other hand, labour supply) does not fulfil the industry's needs. As a result, despite the sector's rising potential, its optimal exploitation is difficult to achieve. According to the qualitative statistics, if unmet demand in the existing labour market is met, the furniture sector's valuation could have expanded 10 per cent each year until 2035. Furthermore, when we consider the growth of value addition elasticity of employment in the furniture sector, which is 28 per cent, the result of the labour demand projection is the same for 2035 (2.8 per cent for the 10 per cent growth). Table 5 shows the industry's projection for 2035, assuming unmet demand is met and value addition is increasing 10 per cent each year. In 2035, the overall labour demand will be 4.20 million, which is more than double the labour supply. As a result, according to projections, this industry has a labour supply shortage. While the furniture industry has grown at a rate of around 13 per cent on average over the last decade, it has fallen short of attaining 10 per cent growth in the last few years due to a lack of supply to meet demand. In 2035, the labour demand and supply mismatch are greatest in production-related jobs about 1.72 million and temporary jobs approximately.13 million (Annexe 1.2). In the production-related activities, there is a significant unmet demand, as well as a mismatch between skilled labour demand and supply. More specifically, the labour shortage is not only

an issue of a lack of numbers; there is also a dearth of training and education among the workers in this industry.

Table 4 Projection of the labour demand in person of the furniture sector (Thousands)

Year	Value addition (BDT Billion)	Total Labour demand	Owner/Proprietor/Partner	Administration & Managerial	Clerical and sales Workers	Production & Related Workers	Temporary Labourers	Family Helper
2022	136.55	1227.895	40.114	55.583	34.573	1017.801	76.476	3.348
2023	150.20	1350.684	44.125	61.141	38.030	1119.581	84.124	3.682
2024	165.22	1485.752	48.538	67.255	41.833	1231.539	92.537	4.051
2025	181.75	1634.328	53.392	73.980	46.017	1354.693	101.790	4.456
2026	199.92	1797.760	58.731	81.378	50.619	1490.162	111.969	4.901
2027	219.91	1977.536	64.604	89.516	55.680	1639.178	123.166	5.391
2028	241.90	2175.290	71.065	98.468	61.248	1803.096	135.483	5.931
2029	266.09	2392.819	78.171	108.315	67.373	1983.406	149.031	6.524
2030	292.70	2632.101	85.988	119.146	74.111	2181.746	163.934	7.176
2031	321.97	2895.311	94.587	131.061	81.522	2399.921	180.327	7.894
2032	354.17	3184.842	104.046	144.167	89.674	2639.913	198.360	8.683
2033	389.59	3503.326	114.450	158.583	98.641	2903.904	218.196	9.551
2034	428.55	3853.659	125.895	174.442	108.505	3194.295	240.016	10.506
2035	471.40	4239.025	138.485	191.886	119.356	3513.724	264.017	11.557

Source: Authors' estimation from LFS 2016-17, and Survey of Manufacturing Industry 2019 and KIIs information (Assuming the value addition of will grow 10 per cent each year till 2035 and growth of value addition elasticity of employment in the furniture industry)

Given the skilled classification in the LFS 2016-17 based on educational attainment and training receipts in table 2, this sector should provide training and basic education through educational institutes. Then there's the decision to make regarding how the training demand coefficient changes over time. Though the change has been maintained low due to rising general education quality and a bigger share of the labour force with tertiary education who will not require training in other industries, the coefficient to give training in the furniture sector must be higher due to its low level of educational attainment. As a result of these dynamics, the importance of TVET is increasing, as is the prospect of on-the-job training. For the year 2035, 434.584 thousand employed people will require training, with 360 thousand of them being production-related workers. Under the supervision of the European Union (EU), a training program is already in place, expanding the training system through technical and vocational training (TVET), and BFIOA frequently organizes a daylong workshop. The BFIOA training is less effective because it only includes two or three days of workshops. Furthermore, training is scarce, as evidenced by the educational and training data.

Table 5: Projection of the training needed in the furniture industry in thousand

Year	Tanning is needed for the total Employed person	Tanning needed for the Production & Related Workers
2022	234.285	194.198
2023	249.692	206.970
2024	265.100	219.741
2025	280.508	232.512
2026	295.915	245.284
2027	311.323	258.055
2028	326.730	270.827
2029	342.138	283.598
2030	357.546	296.369
2031	372.953	309.141
2032	388.361	321.912
2033	403.769	334.683
2034	419.176	347.455
2035	434.584	360.226

Source: Authors' estimation from LFS 2016-17, and Survey of Manufacturing Industry 2019 and KIIs information

Apart from a rough estimate of needed training among employed people, the training required for this sector is divided into distinct sections based on priority. For major industries that have already implemented modern technology, training in the sections of the machine operator and finishing is required; while, for medium and large industries, carpentry, polishing, and Lacquer (designer) sections require urgent training (Annexe 1.3).

3.2 Policy Support

Considering the furniture sector's potential, the government included it as a priority sector in industrial policy 2016 and announced it to be the 23rd priority sector. According to the industrial policy 2016, the export-oriented industry among the priority sector will get special privileges and support from the venture capital/risk fund. Moreover, the government will provide incentives to this priority industry from start-up to commercial mass production, as well as lower import duties on machines. Furthermore, the firms will be supported for the first three years so that they can start commercial mass production. Women entrepreneurs in the priority sectors will get special privileges. Labour productivity is also an important focus of industrial policy 2016, training centres for the priority sector will be set up, and a research and development program will be initiated for each sector.

Besides, the sector has been included as the "highest priority sector" in the export policy 2018-21 as well. This policy emphasizes the increasing production capacity of export industries, product and market diversification and improving product quality and raising the competition in the world market. For the implementation of the policy, the government of Bangladesh has announced a 15 per cent cash incentive to domestic producers on furniture export[11]. Moreover, local and international organization is working for uplifting this industry.

[11] https://www.thedailystar.net/business/export/news/high-import-duty-hinders-furniture-export-2941476

Bangladesh Furniture Industries Owner's Association (BFIOA) works for delivering support to enlisted furniture firms and organizes the training program on the "technology-based manufacturing sector" with help of the government support. Along with this, the international labour organization (ILO) started the apprenticeship training program in 2015 under the B-SEP (Bangladesh: Skills of employment and Productivity) project for developing skilled manpower and enhancing productivity[12].

4. Findings from Qualitative Survey

Along with the secondary analysis, we present the qualitative responders' findings in this section. This section contains the disaggregated occupational category, which proved difficult to analyze using secondary data. As a result, qualitative analysis is required in an attempt to acquire a comprehensive understanding of this sector's occupational category.

The findings from the qualitative response are presented in two ways: first, the occupational structure and required skill level are presented, followed by the current skill gap analysis. We focused on the skill gap, skill shortage, and skill mismatch (Vertical and Horizontal).

4.1 Occupational structure

Workers in the furniture sector are roughly classified as production-related workers and other sales, managerial-related workers, regardless of firm size. Production-related jobs in large and medium firms include production manager, supervisor or senior operator, assistant operator, charge-hand, and helper; in small firms, supervisor or head technician, junior technician, carpenter, and helper are included. The industry's both production and administrative related workers are monitored and administered by the owner of the industry. The following table is based on the qualitative response and includes the skills, education, and experience required to execute relevant works by various categories of workers (Table 2).

Table 6: Types of occupations in the furniture sector

Occupational types	Required skill	Required Educational qualification	Year of experience	Total employment in 2017 (Thousand)	Total employment in 2035 (thousand)	Training needed for 2035 (thousand)
Production manager	❖ Technical expertise in furniture machinery ❖ Monitoring and planning the production process	BSC engineering	1 year	35.184	191.886	19.672

[12] https://bdnews24.com/economy/2015/11/13/ilo-launches-apprenticeship-programme-to-develop-skills-in-bangladeshs-furniture-sector

Occupational types	Required skill	Required Educational qualification	Year of experience	Total employment in 2017 (Thousand)	Total employment in 2035 (thousand)	Training needed for 2035 (thousand)
	❖ Supervise the technicians					
Senior operator/Head technician	❖ Technical knowledge of production ❖ Knowledge of machine operating ❖ Leadership skills for supervising workers	Diploma degree	6 month	644.281	3513.724	360.226
Assistant Operator/ Junior technician	❖ Machine literacy ❖ Core skills (cutting, carpentry, and design ❖ Communication and problem-solving skills	Diploma degree	3 month			
Charge hand/ Carpenter/polisher	❖ Designing, carpentry and burnishing ❖ Numeracy skill ❖ Cooperating with the junior technician	Secondary school certificate (SSC)	3 month			
Designer	❖ Designing ❖ Computer skill ❖ Numeracy skill	Diploma degree	3 month			
Helper/Temporary labour	❖ Assisting carpenter and	Secondary School	No prior experien	48.411	135.335	27.067

Occupational types	Required skill	Required Educational qualification	Year of experience	Total employment in 2017 (Thousand)	Total employment in 2035 (thousand)	Training needed for 2035 (thousand)
	technicians ❖ Basic skills in furniture making ❖ Literacy and numeracy	Certificate (SSC)	ce is needed			
Clerical and sales	❖ Marketing skill ❖ Communication skill ❖ IT Skill	Bachelor of Business Administration (BBA)	6 month	21.885	61.182	12.236
Accounts and finance	❖ IT skill ❖ Numeracy skill ❖ Mathematical skill	Bachelor of Business Administration (BBA)	3 month			
Delivery boy	❖ Time management skill	No education is required	No prior experience is needed			

Source: Authors' findings from qualitative Survey and LFS 2016-17

Typically production-related work is conducted by one production manager, followed by one head technician/senior operator, followed by several junior operators/technicians, followed by several technicians/carpenter/designers, and followed by many helpers. The title of each occupation and the number of workers in each occupation differ from one firm to another, according to the firm size (large, medium or small).

4.2 Vertical Mismatch

The qualitative data revealed that the furniture industry had a significant level of vertical mismatch. The industry owners expect the employees to have a BSC or diploma in engineering, particularly in production-related work. Unfortunately, they only get people who have completed five or eight years of formal education.

The qualitative data corresponds to the findings of the World Bank enterprise survey. According to the World Bank Enterprise Survey (2013), one out of every four enterprises in the furniture industry reported having an under-educated and inadequately trained workforce. Knowledge is essential since it is believed that the more education a person has, the more likely they will be able to learn a task in a short period. Hence, the disparity between the degree of education necessary and the actual level of education impedes the industry's

overall output. For instance, recently, relatively sophisticated machines are being used in the sector. Uneducated workers will require extra time to give a command to the machine for production. Less-educated workers are less likely to finish their work on time, according to the qualitative data. It reduces the productivity of the industry in general. Deficiency in reading and numeracy results in errors on measuring scales such as inches, feet, and so on. The findings show that employees lack the academic training required to perform technical and numerical jobs in the manufacturing process.

Although employers believe that production-related workers learn their respected jobs through on-the-job training, education plays a role in accelerating the learning process. Employers, on the other hand, employ BBA graduates in the cleric and sales fields, where there is no shortage of labour supply based on educational attainment.

4.3 Horizontal Mismatch

In-depth interviews revealed the presence of horizontal mismatch as well. The horizontal mismatch refers to the discrepancy between the desired field of study and the actual field of study of the employees. Employers prefer fresh BSC graduates and students with a diploma degree to those with a general education background. According to the qualitative data, there is a scarcity of workers with BSC and diploma engineering degrees in the furniture sector. The majority of the employees have a general education background. Workers with a general educational background require at least six months of on-the-job training before they can contribute to the production process, the qualitative response suggests. Employers, on the other hand, praised recent graduates from public tertiary educational institutes, which they find difficult to attract.

4.4 Lack of Linkage between Industry and Academia

There exists virtually no link between the furniture industry and academia. According to industry insiders, even fresh BSC graduates and diploma engineers lack the necessary knowledge of the production process in the industry. Employers expect that fresh engineers would understand the manufacturing process and know the basic features of the machines. which are seldom fulfilled. As a result, finding new engineers who are knowledgeable about the production process is difficult in the current labour market. Furthermore, the study of wood has not yet been incorporated into the TVET curriculum framework. As a result, no organized institute or system teaches the woodwork and wood-related production processes.

4.5 The Lack of Trained Labourer

Though there is enough labour in the furniture industry, trained labour is in short supply. Employers demand certain expertise of a worker on production-related work, according to qualitative data. However, they find the employee with no prior experience and no skill at all. The skill gap is more acute in the machine operator occupation in the large and medium firms, and the designer and carpenter occupations in the small firms. Firms cope usually mix unskilled workers with skilled workers as a means of on-the-job training. The productivity of skilled workers, as well as the total productivity of the company, suffers as a result of the mixing of unskilled and skilled individuals. Moreover, during the key informant interviews

(KII), the researchers questioned which occupation is difficult to fill with qualified workers if a vacancy emerges. The qualitative data suggest that in a small firm, filling the vacancies of polisher, designer, and carpenter takes a substantial amount of time, whereas, in a large firm, the machine operator position is more difficult to fill.

4.6 The Informal Nature of the Sector

The data reveals that in the furniture industry, there is a demand-supply imbalance in several occupations. On the one hand, the supply of experienced trained labour is insufficient, while demand is rising as the number of furniture firms is growing. The insufficient supply leads to intense competition among the firms. As a result, experienced and skilled labour switch workplaces frequently from one to another as soon as offered higher salaries. One of the most common reasons for a lack of interest among workers is low wages compared to other manufacturing sub-sectors. Furthermore, lack of motivation, and work ethic, among other soft skills are acute, according to the employers. Many respondents stated that, despite having high physical strength and being paid well, workers have demonstrated a lack of interest in furniture-related jobs due to their behaviour (some are lazy, irregular, and only work when they need money).

4.8 Poor connection with TVET

Workers who have received technical and vocational education and training (TVET) are praised by respondents. Unfortunately, the furniture industry has struggled to attract students with technical or vocational training. Moreover, employers are also less likely to send employees to technical training and prefer on-the-job training. Only a small percentage of firms provide formal training to their employees. Additionally, technical education has a lower likelihood of being enrolled than general education. Because technical education was deemed to be less socially acceptable than general education As a result, enrollment at vocational institutes fell below capacity, and diploma holders were widely undervalued.

4.9 Need for Higher Level of Skills to Integrate into the 4IR

In the furniture industry, a considerable amount of skill gap exists. The qualitative data demonstrated a lack of time management skills, planning skills, team management abilities, communication skills, and computer literacy skills among workers in each occupation. They also lack the essential technological expertise. Technical skills shortages have a direct impact on productivity, and industrial production and industry insiders are concerned regarding this issue, especially in the backdrop of the fourth industrial revolution.

4.10 Demand Category based on task and skill level

The furniture industry has extensive experience with the division of labour. Each sector of the furniture manufacturing industry has a specific task and demands a specific talent. The study looked at the sections and skill levels where labour is in high, medium, and low demand during the qualitative survey. There is a high demand for tasks and sections of manufacturing that require a high level of skill, such as mechanical components (Table 6). The task requiring a

medium level of skill is in medium demand, whereas the task requiring a low level of ability is in low demand because temporary workers are readily available to assist the medium and high-skill workers.

Table 7: The occupation-based demand in the furniture industry

Demand category	Skill Level	Jobs
High demand	High	Process engineer, Machine operator, Finishing line worker, Polisher, Carpenter, Lacquer worker, Supervisor, Upholstery workers
Medium demand	Medium	Computer numeric control operator, Burnish man and sprayer, helper (carpenter), skilled fitter
Low demand	Low	Loader, worker (temporary)

Source: Authors' compilation for qualitative survey

With the assistance of the two furniture owners' associations (Appendix 1.4), which have been working to improve and promote the furniture industry for a long time, it is necessary to develop a comprehensive training curriculum in order to meet the skill level.

5. Recommendations

Bangladesh has a competitive advantage in producing labour-intensive products. The furniture industry is considered a labour-intensive industry since shaping, designing, burnishing, polishing, and mixing wood to form final goods necessitates a greater amount of labour. The sector has the potential to provide more to the export basket given that the sector is equipped adequately to solve the challenges, including the lack of skilled labour force.

Furthermore, establishing a centralized training centre in collaboration with the government and the Bangladesh Furniture Industries Owners Association (BFIOA) may solve the skill mismatch issues in a structured way. Besides, on-job or off-job training has to be implemented with various appropriate structures and guidelines. Moreover, taking training from non-profit international organizations such as the Centre for Design and Technology Limited of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in product design and development can be considered. Access to this type of service in the larger skill must be ensured for all furniture makers in all clusters.

There is no correlation between the skill required by the furniture sector and the skill supplied by the present educational system. Long-term planning and investment, as well as adjustments to the education curriculum to include essential skills, are required to close the overall skill gap. To address the immediate needs of a rapidly growing industry, university and government training institutes should arrange short-term and long-term vocational education and training and courses relevant to the sector. For Example, wood carving, polishing, designing, machine operation, metal works, and high-quality lathe machine operation.

Destigmatizing the TVET education and broader awareness regarding manufacturing jobs is crucial for mitigating the skill gap. It has been noted that workers in the furniture industry are stigmatized. The Government of Bangladesh (GOB) should encourage awareness programs to develop social acceptance for not only furniture workers but also workers at all

levels. Although TVET workers are prioritized by the sector, the availability of technical and vocational education and training is scarce due to the scarcity of technical institutions, teachers, and students who are familiar with the sector-specific issues.

The establishment of a national technical and vocational qualification framework (NTVQF) under the National Skills Development Policy should prioritize the furniture sector. With that, it should be ensured that a new and relevant syllabus is included in the TVET academic curriculum to provide better education and training to the students about furniture and wood. Moreover, The policy must be more precise when it comes to focusing on education and training for the adaption of the upgraded production process, such as computer numeric control (CNC) machinery, computer-aided-design (CAD), and flexible manufacturing system.

Without women's engagement in the furniture industry, the industry risks losing access to the potential of half of the country's population. For example, over 71.5 per cent of women work in the ready-made garment industry; meanwhile, only 7 per cent of women work in the furniture industry (LFS 2016-17). A comprehensive national policy has to be implemented to create a gender-friendly environment in the furniture sector so that, women are drawn to work in the industry. Women may become more prevalent in the furniture industry if they are encouraged to participate in hand carving (especially high-quality wood and metal carving) and RMG sewing for upholstered furniture.

According to the PKSF's (2013) survey, the furniture sector has 71034 businesses, with 70953 of them being micro and small businesses. ***Establishing a furniture village should be implemented to enable small firms the opportunity to manufacture on a bigger scale, allowing them to profit from economies of scale as well as external benefits from capital accumulation, the qualitative responders suggest.*** For this, it is required to provide all necessary support to establish world-class furniture industries. As a result, both domestic and foreign investment will be attracted to this industry.

6. Conclusion

Considering the possibility of the furniture sector and its status as a growing source of foreign currency in Bangladesh, an adequate strategy to strengthen the sector is important for achieving its full potential. The manufacture of furniture is not being fully utilized due to a lack of skilled labour in the industry. The skill mismatch in the furniture industry is investigated in this study by defining skills in various ways. The research reveals based on the qualitative response that skill mismatch exists in all occupational categories. The vertical skill gap is more severe, and this sector faces a hard time filling a vacancy for machine operators and designers.

Following the identification of the skill mismatch, the study provides recommendations for reducing the skill shortage that prevails in this sector. Linking wood-related education and training to academia, expanding practical classes in technical institutes, initiating training programs by both the government and the private sector, and establishing a furniture village to achieve economies of scale could contribute to decreasing the current skill gap in the furniture industry.

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Annex 1

Table 8: Characteristics of interviewees with whom the key interview data were obtained

Profession	Size of the firms	Number of firms
CEO and owner	Large	4
CEO and owner	Medium	6
CEO and owner	Small	4

Source: Authors' compilation from primary qualitative survey

Annex 1.1

Table 9: Gender composition in the furniture sector

Year	Sex	Total	Per centage
2013	Male	676	95.21
	Female	34	4.79
2015-16	Male	789	96.10
	Female	21	2.56
2016-17	Male	723	93.05
	Female	54	6.95

Source: Labour force survey (various years)

Annex 1.2

Table 10 Projection of the labour demand and supply gap in person of the furniture sector (Thousands)

Year	Total employment	Owner/ Proprietor/Partner	Administration & Managerial	Clerical and sales Workers	Production & Related Workers	Temporary Labourers	Family Helper
2022	56.471	1.845	2.556	1.590	46.809	3.517	0.154
2023	102.222	16.270	4.627	2.878	84.732	6.367	0.279
2024	160.253	5.235	7.254	4.512	132.833	9.981	0.437
2025	231.790	20.240	10.492	6.526	192.130	14.436	0.632
2026	318.184	10.395	14.403	8.959	263.743	19.817	0.867
2027	420.922	26.335	19.054	11.852	348.902	26.216	1.148
2028	541.638	17.695	24.518	15.251	448.963	33.735	1.477
2029	682.129	34.868	30.878	19.206	565.416	42.485	1.860
2030	844.373	27.585	38.222	23.775	699.900	52.590	2.302
2031	1030.545	46.251	46.649	29.016	854.218	64.185	2.810
2032	1243.038	40.609	56.268	35.000	1030.353	77.420	3.389
2033	1484.484	61.080	67.197	41.798	1230.487	92.458	4.047
2034	1757.778	57.425	79.569	49.493	1457.021	109.479	4.792
2035	2066.106	67.498	93.525	58.174	1712.594	128.682	5.633

Source: Authors' estimation from LFS 2016-17, and Survey of Manufacturing Industry 2019 and KIIs information (Assuming the value addition of will grow 10 per cent each year till 2035)

Annex 1.3

Table 11: The training needed based on the priority in the furniture section

Section	Rank
Machine operator	1st
Finishing	2nd
Polishing	3rd
Carpentry	4th
Lecquer operator (Designer)	5th

Source: Authors' compilation from KIIs and BFIOA

Annex 1.4

Table 12: List of Institute associated with the Furniture industry

Bangladesh Furniture industries owners association (BFIOA)
Bangladesh Furniture Exporters Association (BFEA)

Source: Authors' compilation from various source

Labor Market Study under Skills for Employment Investment Program (SEIP)

Skill Gap in the Jute Sector of Bangladesh

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Abbreviations and Acronyms

BJMC	: Bangladesh Jute Mills Corporation
SEIP	: Skills for Employment Investment Program
KII	: Key informant Interviews
BJMA	: Bangladesh Jute Mills Association
BJA	: Bangladesh Jute Association
BJSA	: Bangladesh Jute Spinners Association
BJGA	: Bangladesh Jute Goods Association
BJDP	: Bangladesh Jute Diversification Promotion Bureau
BIDA	: Bangladesh Investment Development Authority
GoB	: Government of Bangladesh
GDP	: Gross Domestic Products
APO	: Assistant Production Manager
NSDA	: National Skill Development Authority
R&D	: Research & Development

Executive Summary

The jute industry has seen many ups and downs, and what was once the country's top export earner is now a low-priority sector due to continued losses in production and sales. Jute is used to produce the natural fiver, also known as the "golden fiver," which is used in a variety of textile products and applications. The demand for jute-related products has declined as a result of the cheap plastic products that have been used as a substitute for jute. Furthermore, decreasing production and revenue in national jute mills contributed to a reduction in the sector's potential. National jute mills have been shut down over time because of inefficiency, the inability of revenue earning, and high maintenance costs. However, as environmental concerns have grown, the usage of jute has begun to resurface, as jute products are biodegradable and recyclable, making them environmentally benign. Bangladesh is still the world's second-largest producer of jute after India, and raw jute and raw jute products are the country's second-largest export earner. Bangladesh has potential in recent times due to a rise in demand for ecologically friendly fibre and products. As a result, Bangladesh must place a greater emphasis on the manufacturing of raw jute and jute items. Furthermore, diversification of jute items is a crucial aspect of realizing the full potential of this industry. Diversification, however, has been hampered by a scarcity of skilled labour. A well-planned training and skill development program is required for medium- and long-term growth of this sector to attain its full potential and to address the low skill level.

The study discusses future labour employment in this industry, the skill level required, and the number of people required to give training. The paper is qualitative in character, with just a limited amount of quantitative analysis available at the skilled level. Based on the qualitative responses and discussions with the private and public Jute Mills associations, the current skill level is assessed. According to qualitative statistics, there is a substantial skills deficit in this industry. The job requires a modest degree of education and suitable training, which is lacking in their current position.

The increase in the country's value-added and export revenues captures the country's future potential. If we use the average growth of the value-added over the last few years (4 per cent growth) as an estimate, the value-added would increase to 398 billion BDT in FY2034-35 from 221 billion. Furthermore, export earnings would increase to 2299.7 million US in FY2034-35, representing 4.12 per cent of total goods export earnings, up from 1161.5 million US in FY 2020-21, which represented 3 per cent of total goods export earnings. The employment prediction for the country is based on the value-added elasticity of employment, which means that on average, our employment rises by 6 per cent per year. From 162 thousand in FY206-17, employment in FY2035-34 would increase to 416.25 thousand. The training projection is supported by data from relevant stakeholders and BJSA. According to the qualitative data, if training is supplied as a targeted proportion of employment, the cost of production and wastage will be significantly reduced. Thus, the KIIs suggest that training requires providing the number of employed persons in such a way that 10 per cent of employed persons should receive training. As a result, the KIIs suggest, that training should be provided to the number of employed people in such a way that training accounts for 10 per cent of total employment.

Thus, the industry must provide training to at least 10 per cent of its employees. As a result, by FY 2034-35, the total estimated trained person must be around 41.63 thousand. There is a shortage of skilled workers in the assortment, batching, cutting, and drawing sections, thus training should be prioritized in these sections.

Regarding the possibility of current jute output and export revenues, the country may be able to reclaim its former glory if adequate skill development programs are implemented. The industry organization might take the lead in analysing the sector's growth and revising the training requirements for personnel. BJSA, BJMC, and BJMA can serve as a link between the training program and its implementation. SEIP can receive industry updates on a regular basis from these associations. As a result, establishing a link between SEIP and industry is critical in determining the task and training program.

The forecast is based on a variety of data sources, with a great reliance on the jute sector's value-added and employment elasticity. The projection's validity and utility are determined by how the value-added is realized and how long elasticity employment will last in the future.

1.Introduction

1.1 Background and context

With worldwide growing concerns over environmental issues, natural fibres have emerged as sustainable solutions within the structure of the green industry. Jute is considered one of the sources of natural fibres throughout the world. Though Bangladesh produces considerable volumes of jute fibre and jute goods, the history of the industry is riddled with many ups and downs.

The jute industry of Bangladesh has a long history and tradition, with its root deeply embedded in the economy of colonial Bengal. During the Pakistan period, jute was the most prominent industry of Bangladesh (then East Pakistan) and contributed greatly to the GDP of the whole then-Pakistan. However, in the decades following independence, the jute industry faced a gradual decline both in production and sales. A large-scale privatization program was initiated during the '80s. Nevertheless, the progress of the industry remained stagnant.

In recent decades though, the jute industry has gone through a process of revitalization, with new impetus arising from increased investment and growing international demand. In this context, the jute industry has great potential in terms of forwarding linkage, export diversification and employment. Realization of this potential would require diversification of jute-based products.

Around the end of FY 2019, the export of jute and jute goods amount to USD 1 billion. The 8th Five Year plan acknowledges the challenges associated with competitiveness, induced by "preference erosion" in the post-LDC graduation scenario, particularly for agro-processing industries like the jute goods sector. In this regard, the plan emphasizes product diversification as a strategy for sustaining the industry's growth. Job creation in the jute goods sector has therefore been a priority for the government.

Jute product has been classified as the highest priority sector in the Export Policy 2015-2018. It has also been classified as a special development sector and policies would aim to consolidate its export base. Initiatives including marketing mission abroad and participation in international trade fairs for market expansion will be undertaken to aid the industry's growth. More importantly, loans for jute product exporters through commercial banks will be facilitated. To develop and diversify jute products, the export policy also proposes an integrated plan of action. Recognizing the growing consumer demand for environmentally friendly products, the Export Policy plans to popularize jute products as eco-friendly and capture the associated global market.

To accelerate the growth of the industry and product diversification, there is no alternative to skilled manpower and research and development. However, it has been found that in mills under Bangladesh Jute Mills Corporation, roughly half of the workers employed in the various

production sections are skilled; the rest are semi-skilled or unskilled (Moazzem, et.al, 2009)[1].

This report presents an assessment of the skill level of workers and employees in the jute sector. The findings reflect the concerns raised by industry stakeholders. In conclusion, the report presents some recommendations for addressing the challenges of skill development in the jute industry.

1.2 Objective

Given the favourable atmosphere for jute production in Bangladesh and its demand for both raw and finished products raised from domestic and international markets, we need to utilize the full potential of the jute sector. For this, this study aims to analyze the present skill gap in the jute sector to offer a brighter future for the jute industry. In addition, we have a few specific objectives.

1) To identify the existence of skill gaps, skill shortages and skill mismatches among the workers in the jute industry.
2) To assess the forms of skills needed in the jute sector in terms of meeting rising domestic and worldwide demand.
3) To examine the future structure of labour in the industry, particularly in light of the fourth industrial revolution, as well as technological, managerial, and labour-related challenges.
4) To suggest the prospectus policy recommendation for developing a sustainable solution to fill up the skill gap in this sector.

1.3 Overview of the report

The paper begins with an "introduction" that discusses the relevance of the jute industry for a sustainable environmental solution, as well as the danger that environmental solutions may be hampered due to the current skill gap in the jute sector. Furthermore, The introduction is extended with a review of the historical pattern of jute manufacture in the home market as well as export to the global market. The next section discusses the methodology and the conceptual framework for the study. The qualitative data is mainly collected through Key informants' interviews. The constraints and limitations that were encountered during the collection of the qualitative are discussed in the methodology section. Moreover, the conceptual framework is included in the methodology as a tool for more completely defining the skill gap.

The following section provides an overview of the jute industry as a whole. The global state of jute, its potential as an emerging sector, and governmental support that has been provided thus far to help the jute industry grow are all included in the sectoral review. It also includes the number of jobs generated by this industry. The study's focus is on providing the results of qualitative data analysis, which is presented in the next part. The study's findings analyze the

existing labour skill gap in the jute industry, the reasons for this type of skill gap, and a detailed analysis of the industry's loss as a result of not meeting the requisite skill as the skill expected by the industry. The conclusion and policy recommendation is presented in the final section. In this section, the policy response to minimize the labour skill gap is addressed based on the preceding qualitative analysis, and an attempt is made to offer a possible instrument to provide a long-term solution to the skill gap.

1.4 Conceptual Framework

There are various types of skill mismatch that can occur in any industry. the jute industry could be one of them. For this, the study must define the in-depth skill mismatch that the jute sector may face. For this, different types of skill mismatches are defined, the findings are analyzed and recommendations are given based on these skill mismatches (Table 1).

Table 1: Types of Skill Mismatch

Type	Definition
Vertical mismatch	The degree to which workers' actual education levels are above (over-education) or below (under-education) to those desired/necessary for their present occupations
Horizontal mismatch	Workers are hired for jobs that are not aligned with their education, skills, or expertise. Difference between the desired field of education and the actual field of education
Skill gap	The extent to which employees lack the requisite abilities to complete their existing job duties is determined by the employer's perception
Skill Shortage	The existing supply of skills cannot fulfil the demand for skills by employers at the equilibrium wage. Employers are supposed to employ people who are unqualified for the position.
Hard to fill the vacancy	Which occupation takes the longest to fill if a vacancy arises

Source: Authors' compilation from various sources

The reason to define the skill mismatch differently is that this type of skill mismatch could result in reduced productivity per worker, higher labour costs, higher recruitment and training expenditures, and a negative impact on firms' profitability.

2. Methodology

The research team used two complementing methodologies to reflect the qualitative nature of the study: (i) desk research and (ii) key informant interviews (KII). The existing literature and policy documentation were the focus of the desk research. Insiders from the industry participated in the KIIs.

2.1 Desk Research

For the study, considerable desk research was undertaken. The desk research focused on existing literature on trend analysis of key jute industry indicators and industry-supporting institutional frameworks. A review of the literature on market developments, labour force composition, skill demands, and skill mismatch was conducted in this respect. Documents from the government, including general policies on industry and export, as well as industry-specific policies, were thoroughly examined.

2.2 Key Informant Interview (KII)

For attaining the qualitative data, a key Informants interview (KII) is used which is an in-depth interview with the relevant stakeholders. The interview is designed to conduct with those who have well recognition in working for improving the fields of the jute industry. we have gathered the informants' information from the Bangladesh Jute Mills Corporation (BJMC), Bangladesh Jute Mills Association (BJMA), Bangladesh Jute Association (BJA), Bangladesh Jute Spinners Association (BJSA), Bangladesh Jute Goods Association (BJGA), and Bangladesh Jute Diversification Promotion Bureau (BJDP). Based on the priority basis from governmental jute mills to non-governmental jute mills, and entrepreneurs, we have contacted the relevant top executive of the respected jute industry.

Unfortunately, most of the government's top executives were unable to provide formal interviews due to government jute mills ceased production in 2020. However, we have discussed with many of them to gather information for the study. Most other formal interview was done with private firms and entrepreneurs. We have targeted the largest jute companies and recognized entrepreneurs. In case of rejection of the interview and their unavailability, the targeted executive has been replaced by another executive. Taking several informal discussions with many relevant jute industry stakeholders, the study has completed sixteen formal interviews. The average duration of each KII ranged from 30 to 35 minutes. Moreover, Annexe 1.1 contains the information with whom the KII is conducted and a description of the firm's size and types of jute product the firm produces.

Before beginning the interviews, a semi-structured questionnaire/checklist was prepared, and changes were adjusted when the situation arose during the interview. All interviewees were permitted to record their conversations, which were later transcribed by the researchers, and notes were taken throughout the interview. The researchers extensively reviewed all of the transcripts several times before preparing the findings.

3. Overview of the sector

Jute is the second most vital natural fibre in terms of global consumption after cotton (Basu & Roy, 2008). Jute is renowned for its anti-static and insulation properties as well as low thermal conductivity which makes it one of the most popular natural fibres in the world. Because of its low extensibility and high tensile strength, jute-made packaging materials are breathable and considered to be the most suitable for the packaging of agricultural commodities. The bio-degradable nature of jute has established it as a prevalent alternative to plastic packaging around the world. The global demand for jute and jute goods is growing rapidly with raising awareness around the world to protect the environment from the harmful effects of synthetic fibres. In 2019, the global jute market revenue amounted to $2.7 billion in 2018, going up by 4.6 per cent compared to the previous year.[2] The countries with the highest volumes of jute consumption in 2018 were India (2.1 metric tons), Bangladesh (1.4 metric tons), and Pakistan (91 thousand tons) which combines 90 per cent share of global

[2] https://www.globaltrademag.com/global-jute-market-2019-bangladesh-continues-to-dominate-exports-despite-decline-in-the-past-few-years/

consumption. From 2007 to 2018, the most remarkable rate of growth in terms of consumption, among the main consuming countries, was achieved by Bangladesh.

Bangladesh is the second-largest producer of jute in the world after India. Although Bangladesh was formerly the top producer, due to the lack of technological advancements in the cultivation system made production was stagnant. The jute fibre produced in Bangladesh is often considered to be the best in quality. However, the jute industry has taken a setback, as 79 of the 397 jute mills have been closed over the last few years (Table 2). This ordeal has particularly affected the public sector, as the number of closures under BJMA and BJMC, is proportionately much higher than under BJSA.

Table 2: The distribution of the jute mills between the private sector

Possession	Total	Closed
Under BJSA	200	12
Under BJMA	165	42
Under BJMC	32	25
Total	397	79

Source: Authors' estimation from BJSA and BIDA

The labour-intensive jute sector has been playing a vital role in the socio-economic development of the country. Bangladesh jute industry employs about 500,000 people. But due to the closure of 25 BJMC (Bangladesh Jute Mill Corporation) controlled mills since July 1, 2020, employment in this sector has undergone a severe change (ILO, 2016). The lack of skilled workers in this particular sector affects the overall production and performance.

With the introduction of 'Compulsory Use of Jute Fibre Packaging Act, 2010' and 'Rules for Compulsory Use of Jute Fibre Packaging, 2013', the demand for jute fibre is increasing and the growing market price of raw jute in recent years might play a significant role in the growing interest of farmers to increase the level of production. According to MoF (2021), the production will reach around 77.25 lakh bale from an area of 6.82 lakh hectares in FY 2020-21.[3] According to the Department of Jute, Bangladesh has exported 2.44 lakh metric tons of jute and jute goods from July 2019 to January 2020 (Table 3).

Table 3: Production and Export Volume of Jute Products (July 2019-January 2020)

Organization	**Total production (lakh metric tons)**	**Total export volume (lakh metric tons)**
BJMC	0.42	0.18
BJMA	0.76	0.58
BJSA	1.67	1.68
Total (July 2019-January 2020)	2.85	2.44

Source: Department of Jute, GoB

The demand for jute and jute goods has witnessed a fluctuating trend for several decades in the global market. Bangladesh supplies most of the jute products to the international market with its largest export destination being India. The export has declined mainly due to the imposition of anti-dumping duties by India on jute products of Bangladesh. Bangladesh

[3] Bangladesh Economic Review, 2021, Ministry of Finance

exports raw jute, processed jute, and diversified jute products. A fluctuation in the production of raw jute has been noticed in Bangladesh as well (Table 4).

Table 4: Overview of Production and Export of Raw Jute

Financial Year	Production (lakh bale)	Export volume (lakh bale)	Export value (million BDT)
2012-13	75.72	20.55	14364.6
2013-14	67.85	9.84	7060.4
2014-15	75.01	10.01	8167.4
2015-16	87.64	11.37	11748.5
2016-17	88.99	12.18	11875.3
2017-18	93.10	12.97	12255.5
2018-19	73.15	8.25	8590.5
2019-20	84.50	8.58	8534.1
2020-21	90.91	5.58	6597.3

Source: Department of Jute, GoB

Every year, Bangladesh export jute goods to various countries across the world and earn a significant amount that contributes to the GDP. The export pattern has been stable over the years (Table 5).

Table 5: Overview of Export of Jute Goods

Financial Year	Export (lakh metric tons)	Export value (crore BDT)
2012-13	8.68	6162.62
2013-14	8.08	5224.21
2014-15	8.18	5602.16
2015-16	8.25	6240.00
2016-17	8.04	6430.60
2017-18	8.27	6801.57
2018-19	7.30	5220.85
2019-20	3.58	3051.37
2020-21	2.38	2369.45

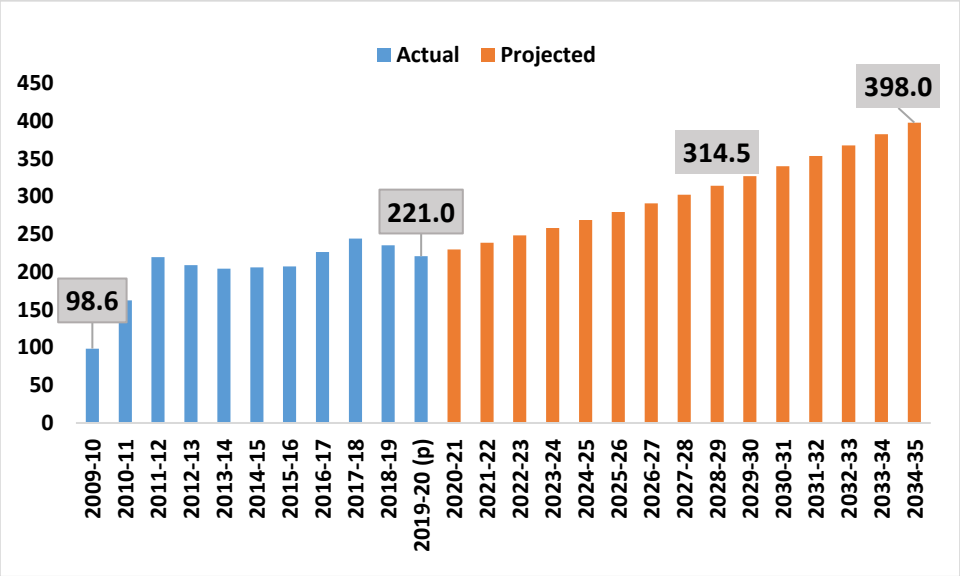
Source: Department of Jute, GoB

Due to the closure of the production of BJMC jute mills in 2020, the demand of international countries like Sudan, Syria, Iran, etc. could not be met. Moreover, the shut-down of the production process hindered meeting the local market demand as well. Amongst all odds, the export of jute and jute-based goods export rose a record 31% in FY 21.[4] Currently, 282 diversified jute goods are exported to around 135 countries of the world. The country is exporting a wide range of jute goods such as yarn, twine, sacks, bags, staple fibres and many more (Annex 1.4). SMEs have contributed significantly to making jute goods more diversified with their innovative ideas.

The jute sector's contribution to GDP has gone through many ups and downs. Despite there being a contraction of the value-added in the past few years, the jute industry has registered an average growth rate of 4 per cent between 2010 and 2020. Projection of value-added based on the 4 per cent growth rate shows that the industry will add the value of BDT 314.5 billion by 2030 and BDT 398.0 billion by 2035. The positive trend in the projection indicates the potentiality of the jute in the coming years.

[4] https://www.tbsnews.net/economy/jute-exports-rise-record-31-fy21-291742

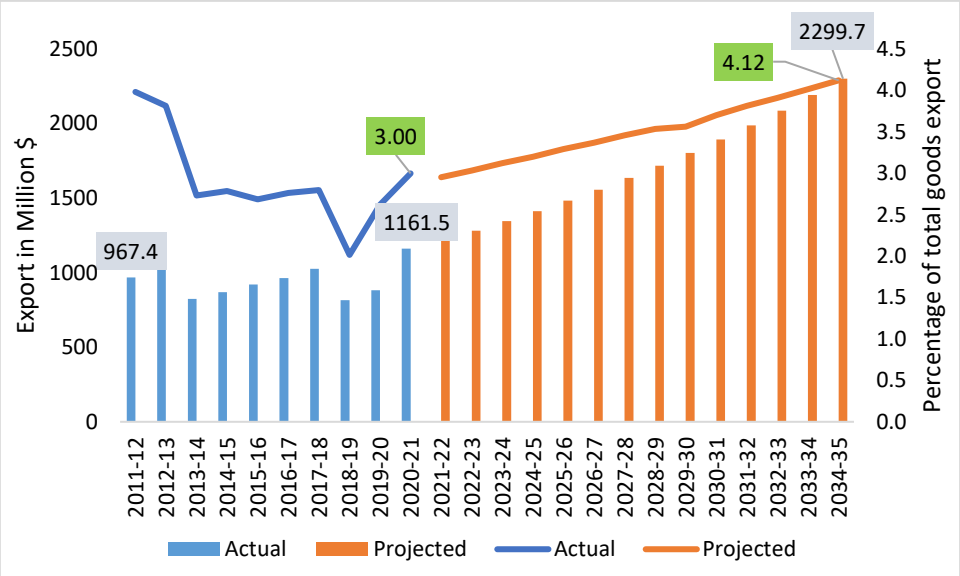
Figure 1: Value-added of Jute in Billion BDT



Source: Statistical Yearbook Bangladesh, 2020 (BBS)

Export patterns are difficult to predict because exports have been in decline for several years. However, due to the global trade downturn, the export trend was dropping in 2014-15, and the downward trend continued for several years after that. However, in recent years, export earnings have rebounded, increasing by an average of 5% per year. Based on this assumption, the projection of export shows that in FY2034-35 export of jute goods will reach USD 2299.7 million (Figure 2). Despite the fact that export earnings have been declining for many years, jute export earnings are still placed second in terms of total export products earnings. As a result, jute products will account for 4.12% of total export products in FY 2034-35, up from 1.12% in FY 2020-21.

Figure 2: Earning from Raw jute and jute goods export and percentage of total goods of export

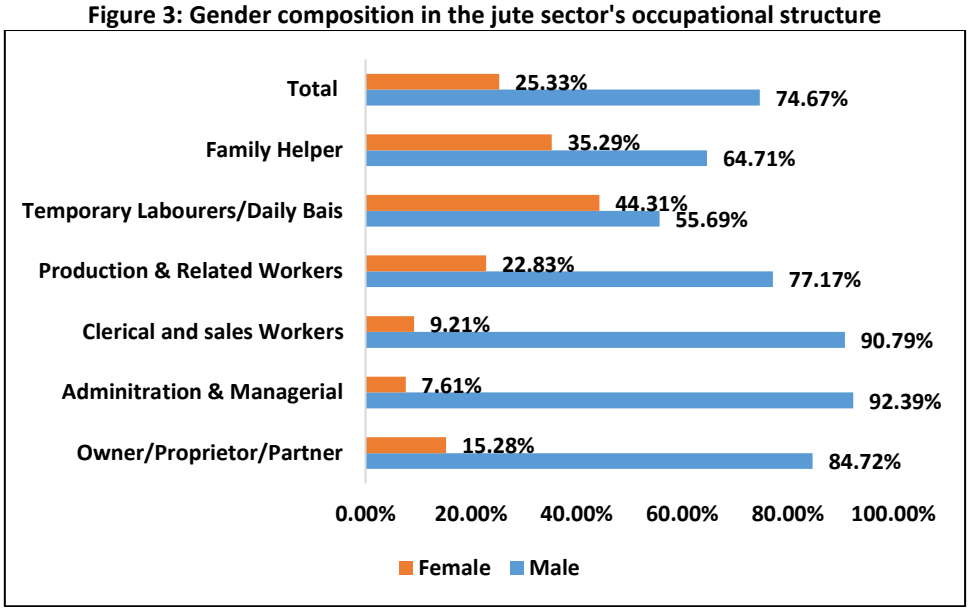


Source: Export Promotion Bureau, 2022 (EPB)

Reflecting the gender composition of the manufacturing sector, labour employed in the jute industry is heavily dominated by males. While male to female ratio is at 1:3, the difference is

higher among production and related workers (Figure 3). As a result, the number of women involved in jute production is smaller. To enhance women's employment in the jute industry, special attention and skill development programs must be provided to them. Moreover, the gender by occupation distribution is provided in Annexe 1.2.

Figure 3: Gender composition in the jute sector's occupational structure



Source: SMI 2019

3.1 Employment and training projection

The projection of labour employment has been made from the elasticity of the employment which is unit free and a good indicator for the employment projection for the coming years. The elasticity of employment is calculated through the incremental percentage change in value-added by the jute industry has been associated with incremental change in employment. The value-added elasticity of employment for each year stands at roughly 0.061 (Table 6).

Table 6: Value-added elasticity of employment

Fiscal Year	Value-added	Employment	Percentage change of value-added	Percentage change in employment	Value-added elasticity of employment each year
2014-15	20,603	156549	0.143	0.035	0.061
2018-19	23555	162000			

Source: Authors' calculations from various source

Based on the value-added elasticity of employment, the total employment in the sector along with distribution in each category has been projected. The projection shows that in 2035, total employment in the sector will stand at 416.25 thousand with 335.649 thousand in production and related work (Table 7).

Table 7: Labour employment in the jute sector in thousands

Fiscal Year	Total Employment	Owner/ Proprietor/Partner	Administration & Managerial	Clerical and Sales Workers	Production & Related Workers	Temporary Labourers/ Daily Basis	Family Helper
2021-22	193.36	.438	3.279	5.350	155.916	28.271	.103
2022-23	205.10	.465	3.478	5.675	165.389	29.988	.110
2023-24	217.57	.493	3.689	6.020	175.437	31.810	.116
2024-25	230.78	.523	3.913	6.386	186.096	33.743	.123
2025-26	244.80	.555	4.151	6.773	197.402	35.793	.131
2026-27	259.68	.588	4.403	7.185	209.395	37.967	.139
2027-28	275.45	.624	4.671	7.622	222.117	40.274	.147
2028-29	292.19	.662	4.955	8.085	235.611	42.721	.156
2029-30	309.94	.702	5.256	8.576	249.926	45.317	.166
2030-31	328.77	.745	5.575	9.097	265.110	48.070	.176
2031-32	348.75	.790	5.914	9.649	281.217	50.990	.187
2032-33	369.93	.838	6.273	10.236	298.302	54.088	.198
2033-34	392.41	.889	6.654	10.858	316.425	57.374	.210
2034-35	416.25	.943	7.058	11.517	335.649	60.860	.223

Source: Author's estimation from various source

Based on the qualitative data, the skill level of the jute sector's workers is analysed, and the projection of the training is provided. The qualitative respondents have suggested that to attain the average growth rate of 4 per cent, each year at least 10 per cent of the total employees will have to be trained. This implies that by 2035, around 41.63 thousand of the total employees will have to be trained (Table 8). That means, if employment elasticity is realized, an additional 4% of the employed person must provide training each year. The qualitative respondents believe that by implementing this training, the industry will be able to cut production costs and waste.

Table 8: Training needed for the number of employees in thousand

Fiscal Year	Total Employment	Administration & Managerial	Clerical and Sales Workers	Production & Related Workers	Helper
2021-22	19.34	.33	.53	15.59	2.84
2022-23	20.51	.35	.57	16.54	3.01
2023-24	21.76	.37	.60	17.54	3.19
2024-25	23.08	.39	.64	18.61	3.39
2025-26	24.48	.42	.68	19.74	3.59
2026-27	25.97	.44	.72	20.94	3.81
2027-28	27.55	.47	.76	22.21	4.04
2028-29	29.22	.50	.81	23.56	4.29
2029-30	30.99	.53	.86	24.99	4.55
2030-31	32.88	.56	.91	26.51	4.82
2031-32	34.87	.59	.96	28.12	5.12
2032-33	36.99	.63	1.02	29.83	5.43
2033-34	39.24	.67	1.09	31.64	5.76
2034-35	41.63	.71	1.15	33.56	6.11

Source: Authors' estimation from various sources including KIIs and BJSA

Apart from the rough estimate, the study has raised the issue of which section of the production line requires priority training. The study discovered that each sector required a certain amount of skilled workers, but that assortment, batching, cutting, and drawing sections require intensive training as a priority (Annexe 1.3).

3.2 Policy Support

The jute and jute products industry is ranked 7th among the 'Highest Priority Sectors' in Bangladesh according to the National Industrial Policy, 2016. According to the Industrial Policy, the jute industry is incentivized greatly for its significant export potential and escalating demand in the local market. A wide range of stimulus packages is offered to the manufacturers and exporters to promote the production as well as the export performance of this industry. The government of Bangladesh has undertaken many initiatives to enhance this sector's performance as the contribution of the jute sector in the development of agriculture and the socio-economic condition is noteworthy. The government has enacted the 'Compulsory Use of Jute Fibre Packaging Act, 2010' and 'Rules for Compulsory Use of Jute Fibre Packaging, 2013'. According to this rule, jute fibre packaging is made obligatory for 17 items which consequently increased the demand for jute fibre in local and international markets. National Jute Policy was introduced in 2011 with a special focus on the following objectives:

- Increase jute production in response to national and international demand
- Proper planning of land used for jute
- Produce high-quality jute seeds and distribute them among the farmers
- Develop modern varieties of jute and encourage the adoption of new technologies in the production process
- Protect the market for jute and jute products to increase export earnings
- Equip jute processing mills with updated equipment
- Increase interaction and institutional linkages amongst jute and jute seed producers, traders, jute industries, and the Bangladesh Jute Research Institute.

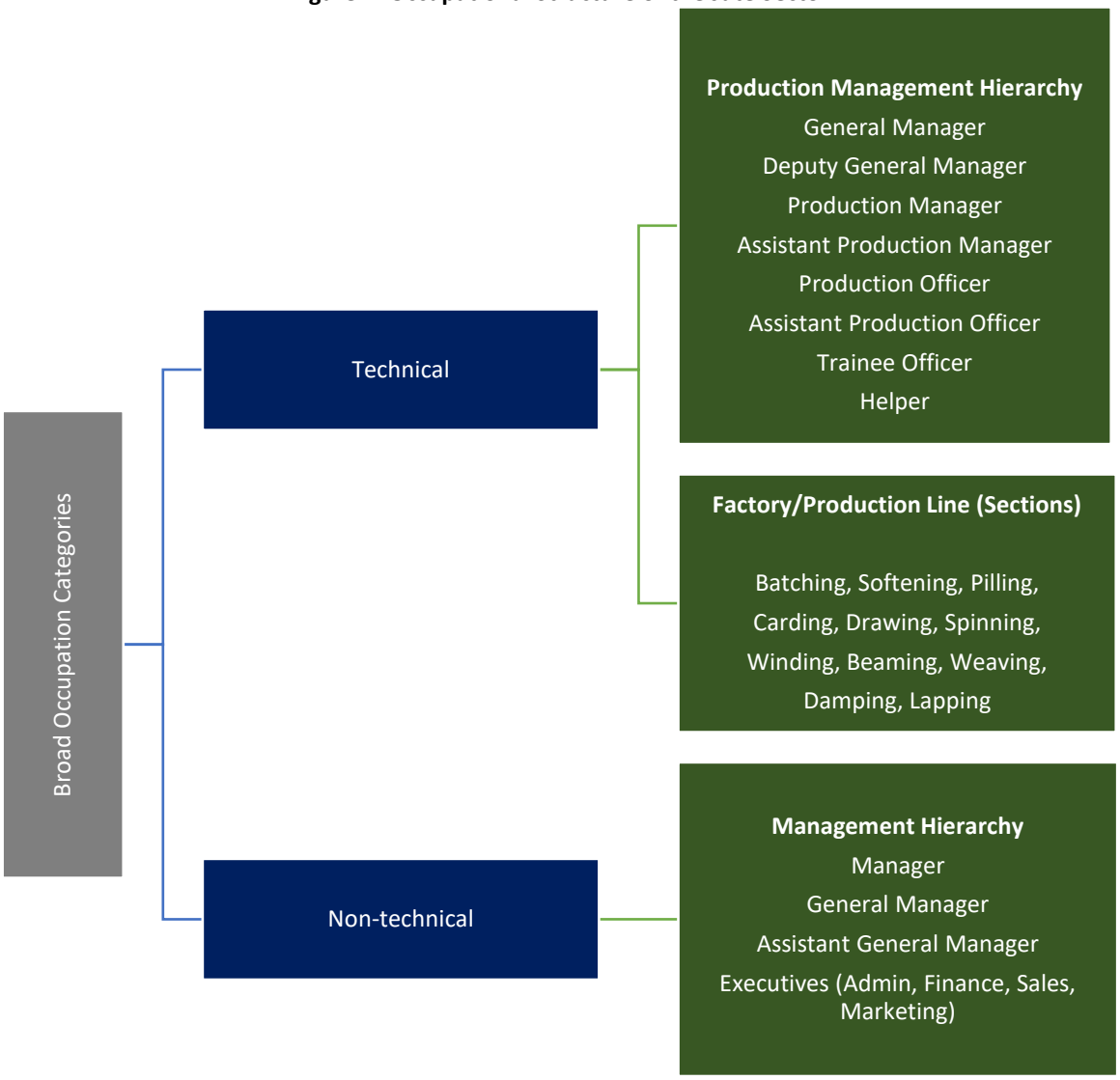
'Jute Act and Bangladesh Jute Research Institute Act' was enacted in 2017 for further development in this sector. The Ministry of Textiles and Jute has declared 282 types of attractive jute goods as "versatile jute products". The formulation and implementation of different action plans of the ministry for the development and expansion of this sector are making an important contribution to the national economy.

4. Findings from Qualitative Survey

4.1 Occupational Structure

There are broadly two categories of workers/employees in the firms producing jute goods. The categories are: technical and non-technical. While organizational structures vary across firms, the general composition can be outlined as depicted in Figure 4.

Figure 4: Occupational Structure of the Jute Sector



The functions and areas of each of the broad categories are distinct; however, the close coordination among these departments requires some common areas of expertise in jute production and market. The occupational structure of the sector has been illustrated in Table 9, which also projects the required amount of skilled labour for sustaining the industry's growth at the rate of 4 per cent till 2035.

Table 9: Occupational Structure and Required Skilled Labour

Category	Occupation	Required Skills	Minimum Required Level of Education	Minimum Required Level of Experience	Employment (2016-17) thousand	Employment 2034-35 thousand	Training needed in thousand (2034-35)
Technical	General Manager	➢ Technical Skill ➢ Understanding of Jute Production	Bachelor's Degree in Science (BSC)	0-3 Years	3.114	8.001	0.80 .
	Deputy General Manager	➢ Technical Skill ➢ Scientific Understanding	Bachelor's Degree in Science (BSC)	0-3 Years			
	Production Manager	➢ Technical Skill ➢ Understanding of Jute Production	Bachelor's Degree/ Diploma in Engineering	0-3 Years	130.631	335.649	33.36
	Assistant Production Manager	➢ Technical Skill	Bachelor's Degree/ Diploma in Engineering	0-3 Years			
	Production Officer	➢ Technical Skill	Diploma in Engineering/ TVET graduate	0-1 Year			
	Assistant Production Officer	➢ Technical Skill	H.S.C in Science	No prior experience required			
	Trainee Officer	➢ Technical Skill	H.S.C in Science	No prior experience required			
	Helper	➢ Basic Understanding of technology	S.S.C	No prior experience required	23.773	61.083	6.1
Non-technical	Manager	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills ➢ Leadership	Bachelor's Degree in Business Administration/Management/Marketing/Textile/ relevant field	0-3 Years	4.482	11.517	1.12
	General Manager	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills ➢ Leadership	Bachelor's Degree in Business Administration/Management/Marketing/Textile/ relevant field	0-3 Years			

Category	Occupation	Required Skills	Minimum Required Level of Education	Minimum Required Level of Experience	Employment (2016-17) thousand	Employment 2034-35 thousand	Training needed in thousand (2034-35)
	Assistant General Manager	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills	Bachelor's Degree in Business Administration/Management/Marketing/ relevant field	No prior experience required			
	Executives (Admin, Finance, Sales, Marketing)	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills	Bachelor's Degree in Business Administration/Management/Marketing/ relevant field	No prior experience required			
	Total				**162**	**416.25**	**41.63**

Source: Authors' compilation from the qualitative data

The jute industry is a labour-intensive industry. However, technological expertise and know-how in production processes are required for factory operations. Therefore, recruiters aim to hire a candidate with a degree in science or engineering. In this case, engineering degrees ranging from textile to mechanical are considered eligible. However, recruiters prefer candidates with an academic background in textile engineering, as it is generally expected that graduates from this field will have a better understanding of production mechanisms specific to jute factories.

On the other hand, for entry to mid-level positions, along with candidates with a degree or diploma, those from arts or commerce can also be considered eligible if they demonstrate a basic understanding of production processes and technology. This has implications for hiring in posts such as helper, trainee officer or APO, as people with a high school degree and basic cognitive skills are hired.

In the case of non-technical departments, the general practice in recruitment in the jute industry is quite the same as in other industries. Candidates with a degree in business, marketing, finance and administration are preferred for this department. For higher posts, candidates with experience of three years are preferred. However, here again, if the pool of candidates does not offer enough choices, candidates with a background in arts or social science or also considered eligible.

4.2 Scarce Supply of Skilled Manpower for Production Management

As the production management section of jute mills require people with technological skill and know-how, the management bodies generally aim to recruit candidates who have earned their bachelor's degree from the field of science or engineering. It is generally assumed in the industry that candidates with a bachelor's degree in science or engineering will have a better understanding of the production processes and sophisticated types of machinery in use. However, the high expectation of the executive management is hardly met as there is a scarce supply of technologically skilled manpower.

The KII respondents expressed deep disappointment about the candidates applying for posts in production management. It was found that the number of candidates with a bachelor's degree in science or engineering was low. The situation puts the management of the enterprises in a difficult position, as they become forced to hire production management executives with academic backgrounds in social science or commerce.

The apparent mismatch in demand and supply posits great challenges for factory operations, as an understanding of the technologies and mechanical processes involved is crucial for production management. KII respondents particularly stressed the importance of textile engineers and pointed out that graduates of textile engineers are in short supply—one of the reasons being their high demand and subsequent placements in other industries such as RMG. The supply of textile engineers is implicated by certain structural constraints such as a few specialized universities or departments on textile engineering, higher demand and competitive salary scales offered by other industries, and opportunities available abroad.

Notably, the management of jute enterprises is equally enthusiastic about hiring TVET graduates and engineers with diploma degrees. In this case, also, they meet the same difficulties and are forced to settle with the skill level offered by the candidate pool. Nevertheless, KII respondents observed that TVET graduates and candidates with a diploma degree in engineering are in higher supply than textile engineers—allowing recruiters some space for choosing their picks.

Apart from concerns about production management, the KII respondents also pointed out that, the sub-par skill level of hired management trainees creates a bottleneck in new designs and product diversification—stymieing the industry's comparative advantage and capacity of competition in international markets. While the lack of skill in new recruitment can be covered over time and with training and experience, the inadequate supply of technical manpower has long-term impacts on the industry's performance.

While the hired candidates are put through training, and gain experience over time, due to their lack of expertise in production technologies, there remains a fundamental gap between the skills offered by the employees and the skills demanded by the industry. This is a classic example of a horizontal mismatch. The issues of skill gap and horizontal mismatch featured prominently across all the KIIs that the study team conducted. Faced with the constraints in skill levels, firms improvise or adopt new strategies to maintain the production operation. To adjust to the skill level offered by the employees, firms often have to compromise or face setbacks in their production goals.

4.3 Lack of Hard Skills among Executives of Administrative and Finance

Responding to inquiries about the skill level of the personnel in administrative and financial management, the respondents observed that while there is an excessive supply of graduates with degrees in business, management, marketing and finances, the skill level of the candidates is not satisfactory. It was found in the KIIs that employers find the employees in administrative and financial management to be lacking in both soft and hard skills. The hard skills, in this case, the respondents pointed out, include a high level of capability and competency in business communication, merchandising, management of supply chain, synchronization of production operation and sales, devising marketing strategies, market analysis and maintaining the financial portfolio. In most cases, the hired candidates have a theoretical understanding of the assignments required of them. However, in practical undertakings, the employees demonstrate a lack of aptitude.

The issue of linkage between industry and academia is once again at work in this scenario. Equipped with mostly theoretical and text-book based training, graduates often find themselves at odds with the occupational demands of the firms they are applying to. The skill needs posted by the firm management are met on paper by the prospective candidates. However, recruiters prefer employees who can demonstrate practical abilities as well as theoretical expertise. It is in this intersection that the skill gap arises—the recruits failing to meet the standards of operation in practical duty.

Reflecting on their experience with business operation and underscoring the need for skilled management executives, the respondents recounted incidences where ineffective communication with foreign buyers resulted in disruption in sales. To counter the skill gap, the top management relies on on-job training and workplace learning to upgrade the skills of the employees. However, respondents noted that there are some inherent limitations to this process as it entails cost and a drop in performance.

While the issue of lacking hard skills can be mitigated to some extent through on-job training and experience, the issue of soft skills is much more critical, and in the case of the jute sector, mostly beyond the scope of organizational interventions. However, the respondents' assessment of the soft skills of the employees emanates some ambiguities. The ambiguities are largely due to the characteristic occupational structure and nature of work of the firms producing jute goods.

It was found in the interviews that there are some drawbacks concerning work ethic and teamwork culture among the employees; although the respondents did not exactly refer to the term "Soft Skill" or relevant terminologies while discussing these issues. Nevertheless, the respondents remarked that they were not satisfied with the interpersonal abilities of the employees. There are also significant differences in soft skills between the personnel in production management and the personnel in administrative or financial management.

Understandably, the difference in the curriculum of business and science faculty is manifested in the level of soft skills of the graduates of these faculties. The curriculum of business faculties includes components requiring more inter-personal communications, while the structure of science studies leaves little space for such components.

The respondents too traced the lacking of soft skills to the curriculum and academic structure of the recruits. Respondents particularly stressed intra-workplace communication and ascribed certain operational difficulties to miscommunication. However, the respondents were found to be less concerned about the lack of soft skills and did not necessarily feel the need for training on soft skills.

4.4 Skill Requirement for Production Line

Due to the labour-intensive nature of the sector, the sections in production lines in factories do not have a demand for a high level of skills. Workers employed in batching, softening, pilling, carding, drawing, spinning, winding, beaming, weaving, damping, lapping, etc., are not required to perform complicated tasks or operate sophisticated types of machinery. Mostly, the workers are required to follow the set routines specified for their particular divisions. The nature of the work also has implications for the nature of employment. Most of the workers hired by private mills are contractual and only a few are designated as permanents.

There is no strict minimum level of education required for employment in the production line, either. Therefore, the jute goods factories can operate rather flexibly and have access to a comparatively larger labour pool. With

4.5 Opportunity for Upskilling Workers in Production Line

The respondents noted that often workers in factories demonstrate the potential to share further responsibilities. In this case, the worker is then promoted to line manager and then often to Assistant Production Manager (APO).

Although such cases are not frequent, some valuable insights can be found from this scenario. Firstly, there are opportunities for workers to acquire skills from the factory houses and demonstrate their abilities. Thus, although the industry is labour intensive and requires fewer technical skills, there are still scopes for workers to advance along with ranks by deepening their knowledge of the industry.

Secondly, employers value workplace learning and appreciate those who develop their hard skills based on practical experience. It is greatly beneficial for upskilling workers and provides necessary incentives in that regard.

Thirdly, if it is possible to upscale the skill level of un-skilled or semi-skilled workers through workplace experience, then intensive on-job training can yield great results. Some respondents pointed out that some firms have adopted in-house training which is proving to be quite advantageous. However, respondents also shared their concerns regarding upskilled workers, who are often quick to switch jobs or migrate abroad for better opportunities. This creates several issues in terms of vacancy and the cost of new recruitment.

The concern for job-switching workers is particularly strong for skilled workers who have been granted permanency. According to the respondents, permanent workers often use their certificate of permanence to allot work to proxy or substitute workers—causing disruption in production in the process.

4.6 Lack of Government and Non-Government Training Facilities

The respondents stressed the need for training facilities and pointed out that there is a lack of both government and non-government initiatives for training facilities. While some firms have set up their systems for training workers and employees, many firms simply do not have the necessary resource to do so. These firms face higher constraints in labour supply and make arrangements accordingly.

On the other hand, firms that do have their training facilities do not receive sufficient support from the government. Observing the importance of on-job training, the respondents expressed their enthusiasm for expanding the training modules. However, without government support such expansion would not be possible, they noted.

4.7 Demand category based on task and section

The study also investigated which occupations have a high, medium, and low demand for the jute sector. The demand category depends on the specific job to which the occupation belongs. There is a considerable demand for technical workers involved in the production process (Table 6). The area that deals with assortment, batching, cutting, and drawing is in high demand. In the jute industry, there is a medium need for machine operators who operate in the softening, carding, spinning, winding, lapping, dampening, and weaving sections, and low demand for those who work in the pilling and bleaching sections.

Table 10: The occupation-based demand in the Jute sector

Demand category	Occupation	Jobs
High demand	Production manager, Production officer/supervisor	Assortment, Batching, Cutting section, and Drawing
Medium demand	Trainee officer/technician	Softening, Carding, Spinning, Winding, Beaming, Damping, Lapping, Weaving
Low demand	Helper/workers	Pilling, and Bleaching

Source: Authors' compilation from KIIs and Desk research

5. Recommendations

As a labour-intensive industry, the jute sector heavily relies on the hard skill of workers and employees. In both technical and non-technical sections and across management and production, the jute industry seriously lacks a supply of skilled manpower. With renewed importance of product diversification, the lack of skilled manpower can have a long-term impact on the industry's growth trajectory and position in the market. Untangling the mismatch between industry demand and the skill level of the labour pool is therefore crucial for any policy interventions.

The issues of skill gap and skill mismatch in the jute industry can be understood better in the context of the manufacturing sector which is largely dominated by the RMG industry. The domination by RMG creates a gravitational pull in the labour market, absorbing skilled and experienced labour who are also in demand in the jute industry. Also, the robust trend of international migration creates a drag on the skilled labour pool, which again has implications for the jute industry.

In this context, a vicious cycle has emerged—with the lack of skilled labour the jute industry suffers from a lower level of productivity and comparative advantage which impedes its growth and thereby places it in a secondary position in terms of job preferences of prospective skilled labour. This self-sustaining cycle has two other aspects. Firstly, the industry's options in the labour market are limited in comparison with other large industries. And secondly, the scope of upskilling the employed labour is narrow as the skill level of the employed labour is sub-par.

Breaking this cycle would require a concerted effort from the government and private sector in areas of academia, technical education and on-job training. However, some primary yardsticks need to be determined first, so that targets remain feasible and in line with the industry demand. Recommendation on the training program for particular occupations in the jute sector is provided in Annexe 1.5. The sections of the training course that must be completed are: batching, drawing, spinning, winding, beaming, twisting, weaving, and finishing, as well as maintenance of jute machinery and jute dyeing and bleaching. EPB, MOJ, BMD and other related organizations should have an active role in the on-job training of the workers.

It should be also noted that guaranteed job placement of workers enrolled in training programs can be greatly advantageous. This will bridge certain gaps between industry and the labour market while providing incentives to aspirant candidates. The nexus between incentive and skills needs to be explored extensively in this regard.

Workers in the backward linkage industries like fabric production and raw jute, significantly lack hard skills—skills related to production techniques and manufacturing technologies. The skill gap in backward linkage industries translates into certain inertia in the jute industry and as a result product diversification and other business strategies are forced to take a backseat. While many jute processing enterprises produce their fabric, most still rely on the local market. Low-quality fabric and raw jute ultimately result in inferior products. Therefore, it is clear that, addressing the skill gap in the jute processing sector will also require giving attention to the skill gap in the backward linkage industries.

On the other hand, a lack of merchandising knowledge has serious implications for the whole industry. The skill shortage among marketing and management personnel results in miscommunication with foreign buyers, ineffective marketing strategies, outdated human resource policy and counterproductive asset management. All of this culminates into a massive drawback which again prevents the industry to address the issues of skill gap.

There is no alternative to update the whole TVET structure to fit the skill demands of the jute industry. Although the industry employs workers from TVET institutions, these workers do not have any prior training in jute processing. The TVET curriculum does not have any special focus or emphasis on the technical occupations in the jute industry. Therefore, a massive change in the curriculum has become mandatory.

6. Conclusion

It is not enough to ensure that students in TVET get theoretical and practical training on jute processing. There must be arrangements which will provide the TVET students with exposure to the real manufacturing processes. In this regard, TVET institutions and jute processing enterprises should enter into agreements for arranging internships, part-time apprenticeships, workshops and regular factory visits. The National Skill Development Authority (NSDA) can coordinate this whole process.

While industry stakeholders commonly express concerns regarding the role of academia, little effort from the private sector can be seen in coordinating with academia. Undeniably, academia is a principal actor and needs to address the industry's skill demand. Nevertheless, there also needs to be private sector-led initiatives in research and student training. Without more private investment in R&D and active engagement with potential candidates, the jute sector will continue to suffer from the shortage of labour and skill. Additionally, there must be a linkage between the textile engineering and jute industries, as textile engineering graduates are now unlikely to work in the jute industry and there isn't a close association between jute fabric and textile yarn education. As a result, the degree in textile engineering must significantly increase the amount of coursework relevant to jute yarn and fabric.

Notably, some actors in the jute industry have already initiated improvised solutions to the skill gap challenges. Government facilitations for these initiatives are imperative as there is a scope of positive spill-over effect for the whole industry. Moreover, The industry organization may also take the lead in analyzing the sector's expansion and changing the requirements for workers' training. The association of the jute can aid in the implementation of the training program. Annexe 1.6 contains a list of organizations involved in the production, sale, and export of jute. These organizations can routinely give an update on the growth of the jute sector and relevant training requirement of the jute industry.

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Annex

Annex 1.1

Table 11: The snapshot of KII

Types of firms	Designation of the respondent	Firm size	Products
Private company	Managing Director	Medium	Gardening, bags, macrame, nursery bag, pouch bag
Private company	Managing Director	Large	Jute yarn, jute fabrics, and jute bag
Private Jute Mill	Director	Large	Yarn and eco-friendly jute products
Governmental organization	Director	-	Market research and development
Entrepreneur	Managing Director	Small	Hat, shoe, cap, bags, household and home decor, office stationery, gardening, and Christmas decoration
Entrepreneur	Proprietor	small	Rope, bags, handbags, craft items

Annex 1.2

Table 12: Gender and occupational composition in the jute sector

Total employment	Male	Female	Total	Percentage
Owner/Proprietor/Partner	122	22	144	0.002
Administration & Managerial	996	82	1078	0.017
Clerical and Sales Workers	1597	162	1759	0.028
Production & Related Workers	39559	11704	51263	0.806
Temporary Labourers/Daily Basis	5176	4119	9295	0.146
Family Helper	22	12	34	0.001
Total	47472	16101	63573	1.00

Source: Survey of Manufacturing Industries 2019

Annex 1.3

Table 13: The training needed based on the priority in the Jute section

Section	Rank
Assortment	1st
Batching	2nd
Cutting Section	3rd
Drawing	4th

Source: Authors' compilation from KIIs and BJSA

Annex 1.4

Table 14: The Basic Jute Products

Canvas	Woven with high-quality fibre, jute canvas is a premium product that along with paper polythene is used in mines and for protection against the weather.
Sacking Cloth	Made out of low-quality jute fibres, this loosely woven heavy cloth is used for packing food grains, sugar, cement etc.
Hessian Cloth	Weighing between 5 to 12 ozs per yard, hessian cloth has high international demand.
D.W. Tarpaulin	This good is highly used for coverings.
Bags	Usually made from sacking or hessian cloths and used mostly by consumers as shopping bags.
Hydrocarbon-free jute cloth	A hessian fabric, treated with vegetable oil, is highly used for packaging.
Geo- Textile	Used to prevent soil erosion and landslide.
Serim cloth	Light weight hessian cloth, mainly used in the felt industry, to protect the non-woven fabric and strengthen paper with lamination.
Tobacco sheets	Made from hessian cloth and used in tobacco production
Decorative items	Decorative products can be produced from jute fabrics.
Hessian tapes and gaps	Made from hessian cloth and used to make small width taps

Annex 1.5

Table 15: Training Programs for the jute sector

SL	Sections
1	Batching, Preparing and Drawing
2	Spinning, Winding, Beaming and Twisting
3	Weaving and Finishing
4	Maintenance of Jute Machinery
5	Jute Dying & Bleaching

Annex 1.6

Table 16: List of organizations associated with the Jute Industry

Bangladesh Jute Spinners Association (BJSA)
Bangladesh Jue Goods Exporters' Association (BJGEA)
Bangladesh Jute Mills Corporation (BJMC)
Bangladesh Jute Mills Association (BJMA)
Bangladesh Jute Association (BJA)
Jute Diversification Promotion Centre (JDPC)
Department of Jute
Bangladesh Jute Research Institute (BJRI)

Labour Market Study under Skills for Employment Investment Program (SEIP)

Skill Gap in the Pharmaceutical Industry of Bangladesh

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Abbreviations and Acronyms

LDCs	: (Least Developed Countries)
TRIPS	: Trade Related Aspects of Intellectual Property Rights (TRIPS
WTO	: World Trade Organization
TVET	: Technical and vocational education and training
CAGR	: Compounded Annualized Growth Rate
DGDA	: Director General of Drug Administration
FPP	: Finished Pharmaceutical Products
KII	: Key Informant Interviews
BAPI	: Bangladesh Association of Pharmaceutical Industries
PCB	: Pharmacy Council of Bangladesh
BPS	: Bangladesh Pharmaceutical Society

Executive Summary

With a record of impressive performance and increased capacity for value generation, the pharmaceutical industry stands to become a major driver of Bangladesh's growth in the coming decade. Across international markets, the country's pharmaceutical brands have gained wide recognition and a reputation for quality products, as evident in the approvals issued by the U.S. Food and Drug Administration. According to the Export Promotion Bureau, between July 2019 and June 2020, Bangladesh exported pharmaceutical products to 118 countries. However, only 21 countries account for the majority of the export share, which is around 88%. To only four countries, including the USA, Bangladesh's pharmaceutical exports amount to USD 10 million or more. However, in the USA market, Bangladesh's share is only 0.02%.

While the industry is highly dependent on the import of API and other raw products, the export scenario illustrates the sector's capacity in terms of production and market penetration. Maintaining consistency in product quality and catering to the diverse demand of a global customer base are two defining characteristics of the industry. Yet, the question remains whether this relatively young industry is on the right track to realizing its full potential.

The industry's growth cycle is subject to a number of factors including dynamics of the international market, local policy support and the gap between demand and supply of skilled labour. In the context of the evolving global demand milieu, the industry is faced with a capacity challenge which requires a persistent inflow of skilled labour. A serious skill gap persists in the industry in the form of skill shortage and skill mismatch. The skill gap affects the industry's productivity, performance and efficiency. There are mid to long-term implications for the industry in this regard, in terms of the industry's position in the local and global markets and competitiveness.

Taking into consideration the challenges the industry face in the immediate future, the issue of the skill gap gains all the more significance. As countries around the world embrace automation and artificial intelligence, tightening the competition in the international, it has become mandatory for Bangladesh to improve productivity in manufacturing. For a highly technical industry like the pharmaceutical industry, there is no alternative to adopting innovative technologies—a task that would appear daunting in the face of the stark skill gap.

More importantly, Bangladesh is set to graduate from the list of LDCs (Least Developed Countries) in 2026 which will spell the end of preferential trade benefits and waiver from the Trade Related Aspects of Intellectual Property Rights (TRIPS). Notably, the TRIPS deadline for graduating LDCs was not extended at the 12th Ministerial Conference of the World Trade Organization (WTO), held in June 2022. Such changes in the international trade regime may induce serious damage to production capacity and market access unless the pharmaceutical industry makes progress in technological innovation and business strategy—both of which are largely dependent on the skill level of the workforce.

This study undertakes a qualitative approach to assess the existing skill gap in the pharmaceutical sector and identify the key factors behind it. It has been estimated that by

2026 the industry will face a shortage of 68365.97 production-related workers and if the industry grows at an average rate of 15%, at least a total of 160720.91 skilled employees in the technical category and 98725.10 skilled employees in the non-technical category will be required by 2035. Without immediate policy actions, it would not be possible to close the mounting gap between labour supply and demand.

There are several sources of skill gap including lack of institutional support, lack of industry—academy collaboration and free riding tendency among market players. To attain the full growth potential of the industry over the next decade, it is absolutely important to address the issue of the skill gap in the sector through extensive and well-designed policy measures.

Addressing the skill gap in the sector will require first and foremost a comprehensive assessment of the existing workforce and the industry demands. The government needs to take the role of coordinator to build and maintain an effective relationship between academia and the industry. Changes in educational structure, including curriculum, across higher educational and TVET institutions are crucial and all concerned parties need to take initiatives in this regard.

Sector-specific occupational composition and associated demand for skill have been at the center of this study. The analysis appraises stakeholders' concerns and priorities with regard to specific aspects of skill shortage and skill mismatch. Based on the projection of labour supply and demand, future manifestations of the existing skill gap have been addressed.

The skill gap in the pharmaceutical industry needs to be addressed as part of a comprehensive framework and needs to focus on sector-specific needs. Both private and public stakeholders have a large role to play in terms of facilitating policy interventions aimed at addressing the skill gap.

1. Introduction

1.1 Background and Context

The pharmaceutical industry of Bangladesh is a highly promising sector with the potential of rendering essential momentum for sustenance and acceleration of the country's growth. Facilitated by domestic institutional support and a patent exemption through the TRIPS agreement under the WTO framework, the pharmaceutical industry was stimulated to a growth trajectory during the mid-1980s. A new and ever-expanding horizon of export of pharmaceuticals has emerged since then. The Government of Bangladesh has identified the pharmaceutical industry as one of the high-priority industries in its 2016 Industrial Policy. With a greater scope of production of generic medicines and boosted demand in the overseas markets, the industry has been consistently registering a compounded annualized growth rate (CAGR) of 12.1% over the last five years. The sector's contribution to Bangladesh's GDP stands at 0.9% (Huda & Chowdhury, 2021).

Currently, there are approximately 257 licensed pharmaceutical manufacturers, of which around 150 are functional. In almost altogether, 98% to be precise, of the domestic demand for medicine is met by the local manufacturers. The remaining 2% includes vaccines, anti-cancer products and hormone drugs which compose the import bracket. Among the locally manufactured pharmaceutical products, 80% are generic and the rest 20% are patented. According to the Director General of Drug Administration (DGDA), the industry produces 3,657 generics of allopathic medicine, 2,400 registered Homeopathic drugs, 6,389 registered Unani Drugs and 4,025 registered Ayurvedic drugs (DGDA, 2022).

The pharmaceutical industry has largely two distinguished, yet intertwined production modules: (i) Finished Pharmaceutical Products (FPP) i.e. medicine ready for consumer end and (ii) production of Active Pharmaceutical Ingredients or API, i.e. chemical compositions required for FPPs. However, API production is a relatively new undertaking in the industry.

The size of the export market for pharmaceutical products is USD 169.0 million and is expected to cross USD 1.5 billion by 2030. Some projections estimate the industry's CAGR to be 15-16% in the coming decade. Following these estimations, it has been forecast that Bangladesh's pharmaceutical industry will grow up to BDT 1.0 trillion by the end of this decade (Huda & Chowdhury, 2021). According to some estimates, the size of the local market, is about BDT 25,000 crore ($3 billion) in 2019, whereas in 2012 it stood at about BDT 9,390 crore and in 2017 it hit the mark of BDT 18,755.6 crore (Chakma, 2020).

It is worth noting that the pharmaceutical industry is highly technology- and capital-intensive, and therefore requires a consistent supply of skilled manpower. The industry demands sophisticated knowledge and high cognitive ability at each level of the operations encompassing production and marketing. Aspirants can avail of graduate, postgraduate and diploma degrees in pharmaceutical science from 41 universities and 51 institutes in the country. Each year, around 1000 pharmacy graduates are produced from these institutions. Currently, there are 20,000 pharmacists employed in the sector.

In the context of challenges associated with Bangladesh's LDC graduation and the coming 4th industrial revolution, with robust industry-level growth, and increased domestic and international demand, the demand for skilled manpower in the pharmaceutical industry will pose to be a considerable challenge. There already exists a significant level of skills gap and skills shortage in the industry. The paper aims to assess the skills gap and skills shortage through the eyes of the industry insiders and leaders. In this regard, several KIIs have been conducted with mid to senior-level executives. The insights, opinions and understandings obtained from the interviews have provided the fundamental structure of this paper.

1.2 Objectives

The study has the following objectives:

i) A comprehensive investigation of the quality of the labour supply in the pharmaceutical industry
ii) Identification of sector priorities in terms of skill gap as defined by stakeholders
iii) Assessment of the existing skill gap in the pharmaceutical sector and areas in requirement of intervention
iv) Analysis of the sector-wise occupational composition of employment and project labour market dynamics

1.3 Overview of the report

The report on the Pharmaceutical Sector focuses on particularly two aspects: the potential of the sector in the mid to long term and the skill gap in the sector. In this endeavour, the paper begins with an introduction to the general characteristics of the sector and the existing challenges to the sector in terms of the skills gap. In the following section, the methodology of the report is presented. The methodology outlines the mode of desk research and KIIs conducted for the study, along with the standards and protocols maintained. This section also provides the conceptual framework followed by the report.

The report then proceeds to present a more detailed picture of the sector in the section titled "Sectoral Overview". This section presents an account of the growth and labour force dimensions of the sector. An analysis of the growth pattern of the sector and potential areas for improvement have been produced in this section. The section provides a general assessment of the composition of the labour force employed in the sector. In continuation of the initial analysis of the labour force composition, the report then presents a qualitative analysis of the skill gap in the sector. Findings from the KIIs are arranged based on priority as felt in the concerns expressed by the interviewees. The analysis also incorporates the study teams' findings from desk research.

The report introduces some recommendations based on the KIIs and the analysis of the study team. The recommendations address the multifaceted issues of the skill gap existing in the pharmaceutical sector. In conclusion, a summary of the report and the experience of the study team is presented.

1.4 Conceptual Framework

Definition of Skill: There are broad definitions of skills. While the definitions and perceptions by different organizations and agencies vary from each other, nonetheless, there are core similar themes.

Soft Skill and Hard skill: Soft skill refers to inter-personal abilities, behaviour traits and other non-cognitive skills of a person's nature of working and relationship with the overall working environment. This includes an employee's communication abilities, teamwork spirit, management capacity, etc. (Cimatti, 2016). Hard skills refer to the specific set of skills required for an employee in a particular sector or operation. The hard skills demanded in the pharmaceutical sector include an employee's theoretical and practical understanding of production, management and marketing (Hendarman & Uwe Cantner, 2018). The present paper reflects on the qualitative analysis of mainly the hard skills of the labour force employed in the pharmaceutical industry.

Skill Mismatch: There are often mismatches between the skills demanded and the skills offered by the labour force (ILO, 2020). This is known as skill mismatch. Skill mismatch can also be categorized into different forms such as vertical and horizontal mismatches. While labour markets should function to maximize the utility of labour productivity, issues of over- or under-education can lead to loss of productivity or output.

Skill Gap: The firm-level measure of skill mismatch in terms of the firm's demand and employees' supply of skill level as perceived by the employers can be defined as a skill gap. Under the broad concept of skill gap the workers' level of ability and capacity to meet the demand of their firms can be measured. Skill mismatch has implications over the dynamics of labour productivity, cost of scaling up of skill of employed labour, output, etc. (ILO, 2013).

Skill Shortage: Skill shortage is the particular situation when the demand for skills by employers cannot be met by the available supply of labour at the equilibrium wage rates—there is a lack of suitable candidates for the vacancies in the firms (ILO, 2013).

Over-education and Under-education: Over-education and under-education are indicators of the degree of match between the employer's demand of skill and the workers' offered level of skills. Issues of over-education and under-education are also referred to as vertical mismatch (McGuinness et al., 2018).

Horizontal Mismatch: In the case of a worker's appointment to a particular job for which the said worker does not have any relevant skill is known as horizontal mismatch (ILO, 2020).

2. Methodology

In line with the qualitative nature of the study, two complementary approaches were adopted by the research team: (i) Desk Research and (ii) Key Informant Interviews (KII). The desk research focused on the existing literature and policy documents. The KIIs were conducted with industry insiders.

2.1 Desk Review

Extensive desk research was conducted for the study. The desk research focused on existing literature on trend analysis on key indicators of the pharmaceutical industry and institutional frameworks in support of the industry. In this regard, literature on market trends, labour force composition, skill demands and skill mismatch were reviewed. Government policy documents including general policies on industry and export and industry-specific policies were assessed thoroughly as well. However, there is a dearth of secondary data on skill level in the pharmaceutical industry of Bangladesh, as noticed during the desk review phase.

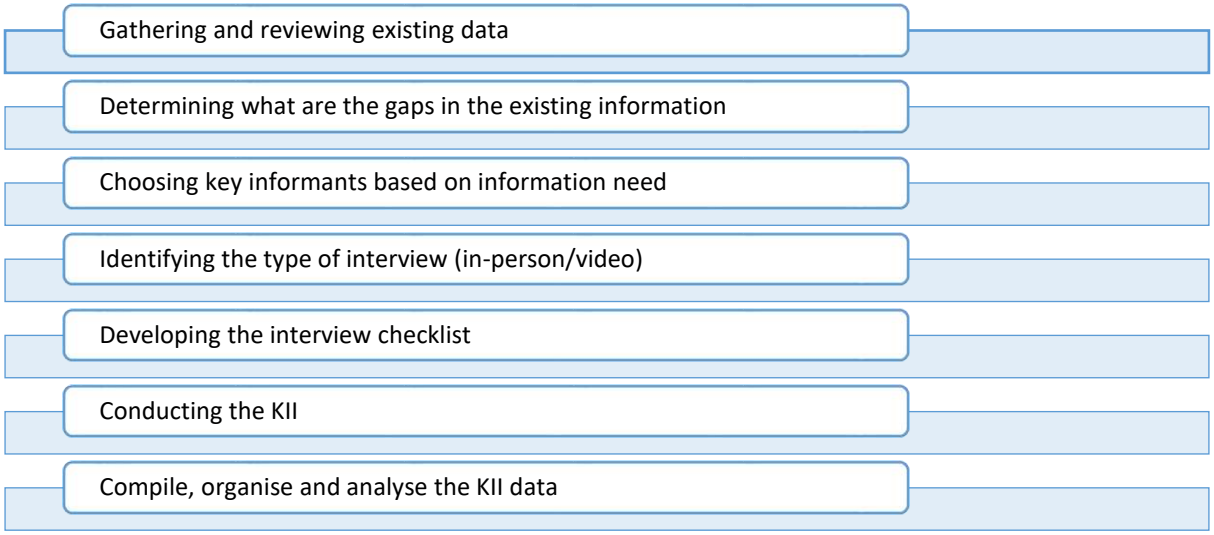
2.2 Key Informant Interview (KII)

Key Informant Interview (KII) is an essential tool for comprehensive qualitative research. For this particular study, the KIIs were conducted with senior-level executives of companies that are long-time market players and representatives from the associations of pharmaceutical manufacturing companies (Annex 1.1 and 1.2). A systematic approach was followed in arranging and implementing the KIIs. The KIIs were aimed at investigating the industry stakeholders' perspectives on the skills gap in the pharmaceutical industry. The senior-level executives have the experience and therefore insights on the skill level of the currently employed workers of the industry and also the aspirant candidates, as anticipated by the study. Furthermore, the questionnaire also looked into the areas which appeared crucial to the study team during the desk research.

The KIIs were conducted both in-person and online. Upon completion of the KIIs, each interview was carefully transcribed by the study team. Later, they were organized and analyzed by the study team. However, the study team also held detailed discussions on the KIIs, which inquired into the nature and content of the respondents' statements as well as the observations of the interviewer.

The in-depth nature of the question required a highly intensive interview with the informant. Regardless, due to the busy schedule of the informants, the interview had to be tailored accordingly. In implementing the KIIs, the following method, as shown in Figure 1, was incorporated:

Figure 1: KII Implementation Plan



Source: UCLA centre for Health Policy Research

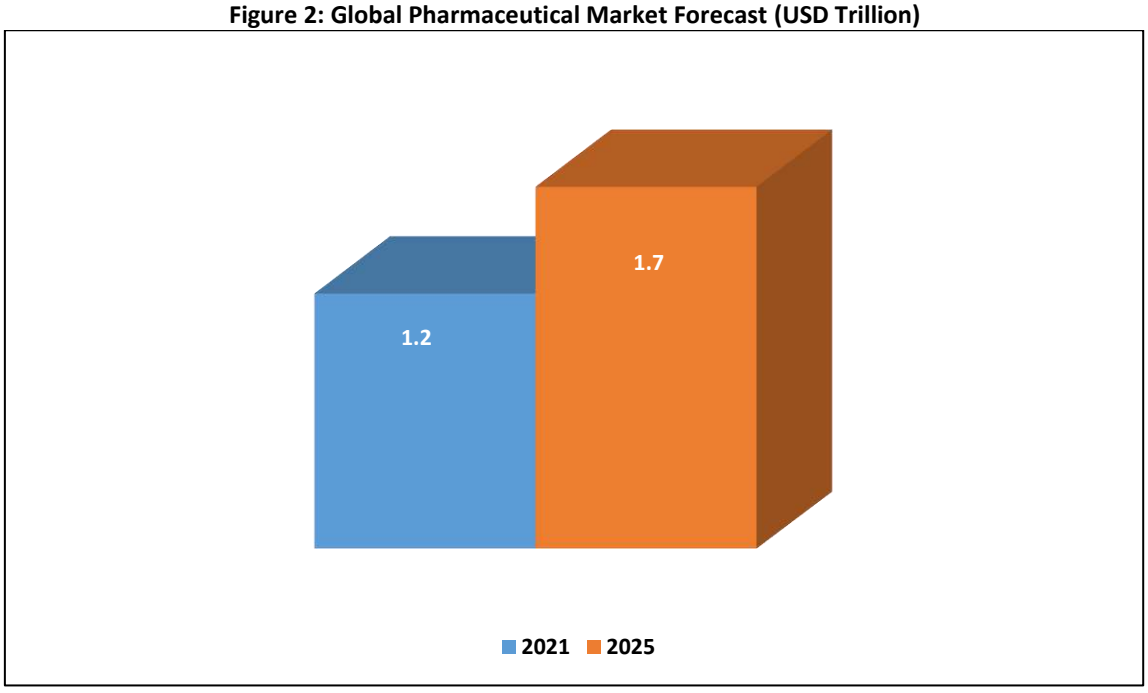
Following the health protocol sanctioned for protection against COVID-19, proper social distancing, etc. was maintained during the in-person interview. However, such conduct reduced the interaction between the interviewee and the interviewer. Furthermore, a certain level of relative lack of comfort could be sensed on the part of the interviewees during the online interviews. Annex 1 provides a snapshot of the KIIs performed.

3. Overview of the Sector

3.1 Overview of the Global Pharmaceutical Market

The progress of Bangladesh's pharmaceutical industry is closely linked to the dynamics of the international market. Momentum in the international market has been generated by both supply side and demand side thrusts. Through the introduction of state-of-the-art technologies, cost-effective and more efficient manufacturing processes in the industry, and increasing demand for complex medicinal treatments across the world, the global pharmaceutical market has been sustaining stable growth. Valued at USD 405.52 billion in 2020, the global market for pharmaceutical manufacturing is estimated to register a compound annual growth rate (CAGR) of 11.34% from 2021 to 2028 (Grand View Research, 2021). With the COVID-19 pandemic in the backdrop, in 2020 global pharmaceutical market was estimated to be around USD 1.2 trillion at ex-factory prices (BCC Publishing, 2022). Another estimate finds the global pharmaceutical market to grow at a CAGR of 8% (The Business Research Company, 2021), projecting the size of the market to be at USD 1.7 trillion in 2025 (Figure 2).

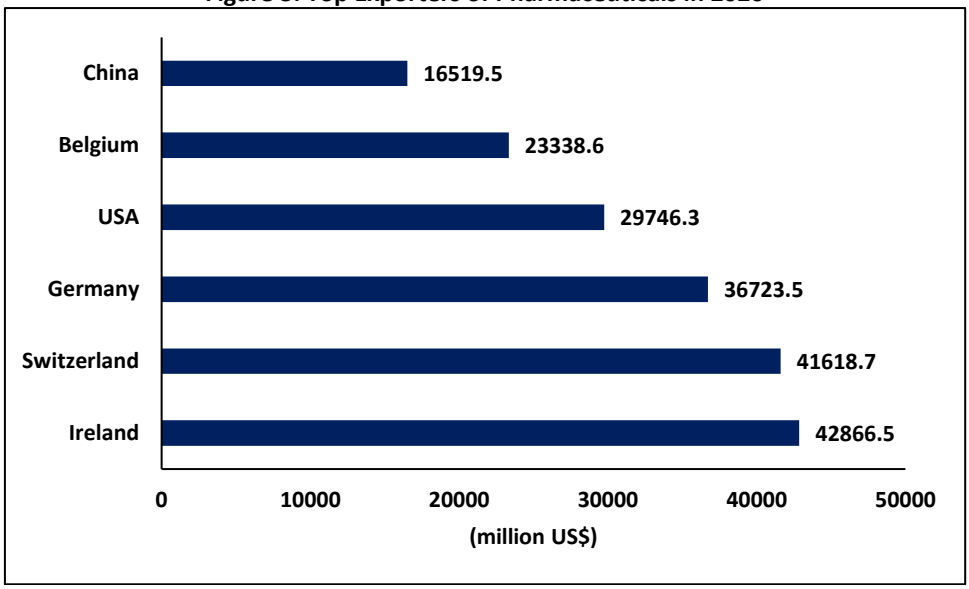
Figure 2: Global Pharmaceutical Market Forecast (USD Trillion)



Source: Pharmaceuticals Global Market Report 2021: COVID-19 Impact and Recovery to 2030

Globally, the export market of pharmaceutical products is dominated by developed countries like the United States, Germany, Ireland, Belgium, Switzerland and developing countries like China. This scenario was largely maintained in 2020 (Figure 3) and shows the market dynamics that Bangladesh is faced with.

Figure 3: Top Exporters of Pharmaceuticals in 2020

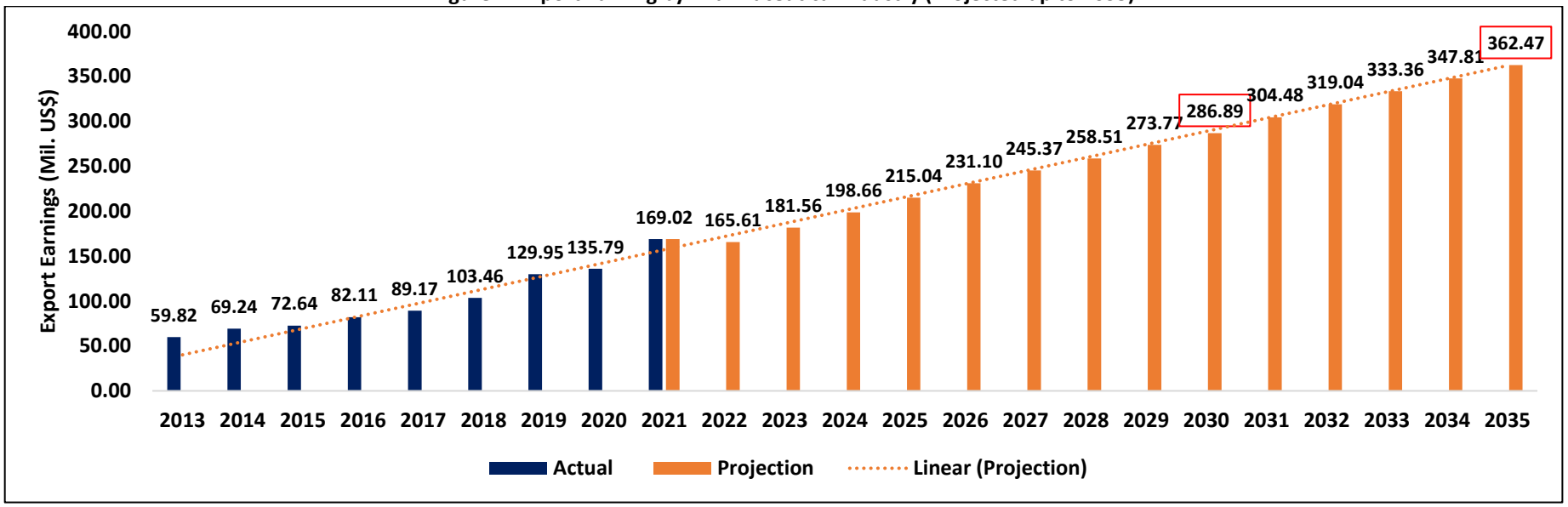


Source: UN International Trade Statistical Yearbook 2020

3.2 Overview of Pharmaceutical Industry in Bangladesh

Bangladesh's pharmaceutical industry has seen extraordinary growth in both local and international markets. Export has been rising consistently at an increasing rate over the last decade which shows the industry's capacity in making headway into the global market. More importantly, the linear projection shows that export earnings can reach up to USD 286.89 million by 2030 and USD 362.47 million by 2035 (Figure 4).

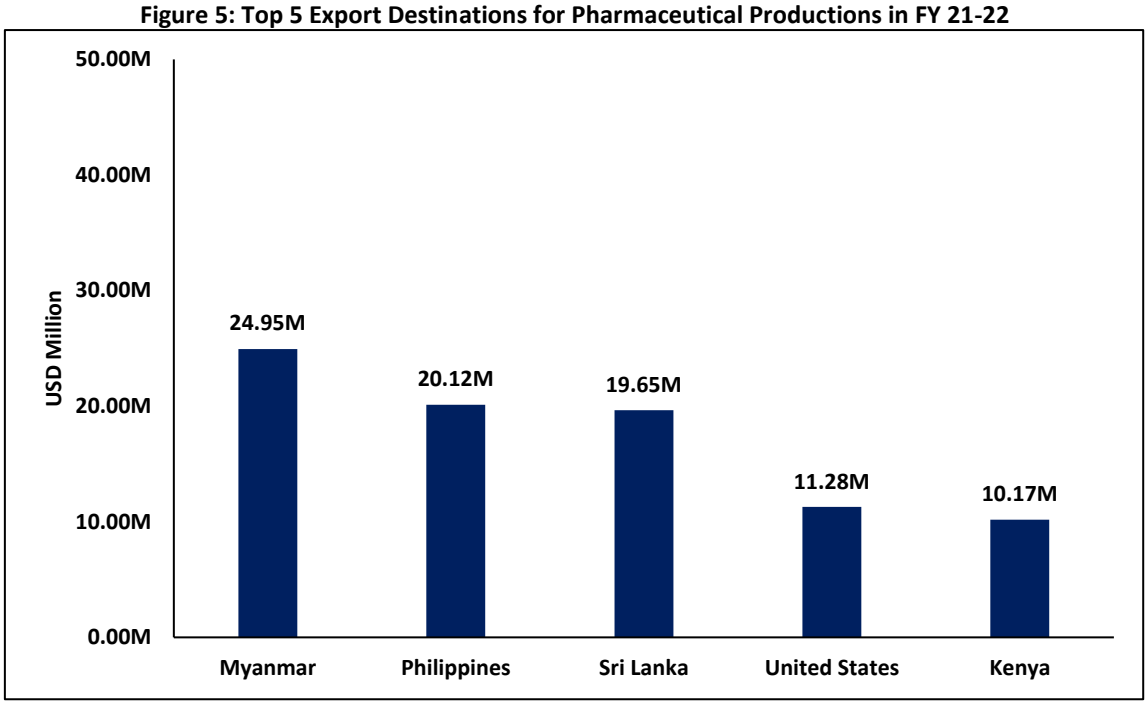
Figure 4: Export Earning by Pharmaceutical Industry (Projected up to 2035)



Source: Export Promotion Bureau (EPB), 2022 and Author's Calculation based on Data from EPB

Currently, Bangladesh exports pharmaceutical products to 151 countries (Export Promotion Bureau, 2021). The top export destinations include countries in South Asia, Africa and North America. In 2020, Bangladesh exported USD 24.95 million, the highest, to Myanmar, followed by the Philippines, Sri Lanka, United States and Kenya (Figure 5).

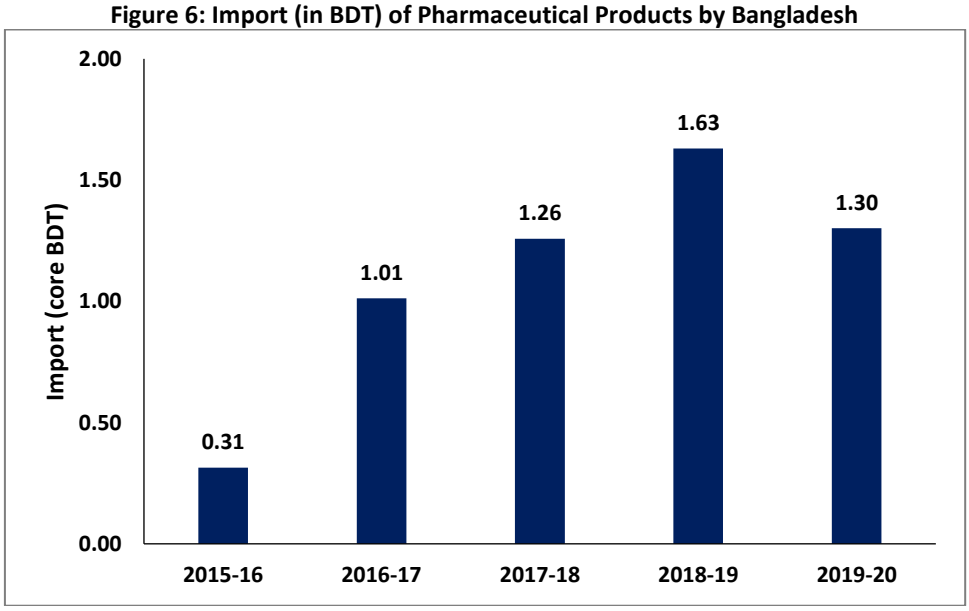
Figure 5: Top 5 Export Destinations for Pharmaceutical Productions in FY 21-22



Source: Authors' Compilation based on data from EPB (2021)

Patent exemption, institutional support and growing demands in international markets of Asia and Africa have contributed to the increase in export earnings through the pharmaceutical industry. On the other hand, since 98% of the domestic demand is met by local manufacturers, the import bracket of pharmaceutical products is very limited. The domestic market has, therefore, also been under the domination of local manufacturers (Figure 6).

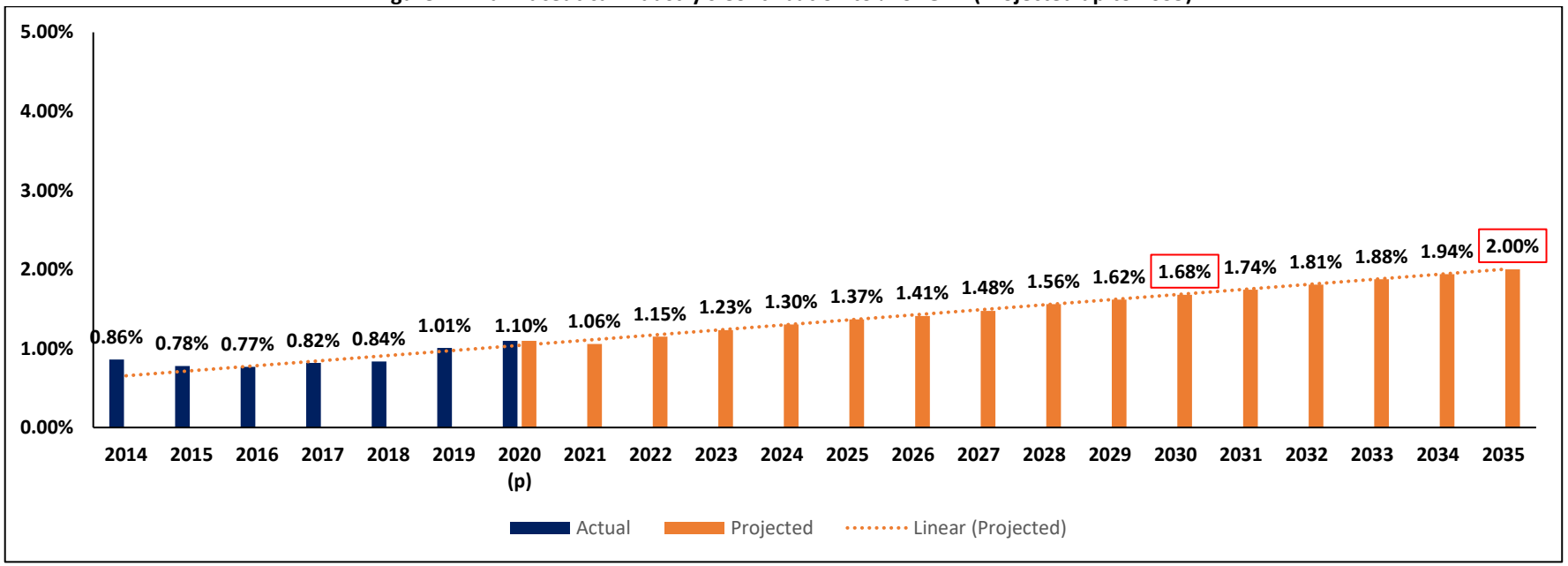
Figure 6: Import (in BDT) of Pharmaceutical Products by Bangladesh



Source: BBS, 2021

Driven by a strong local market presence and sustained growth in export, the pharmaceutical sector has the potential to become a major contributor to total GDP. In 2020, the industry contributed 1.10% of the GDP which is projected to be at 1.68% by 2030 and 2.00% by 2035 (Figure 7).

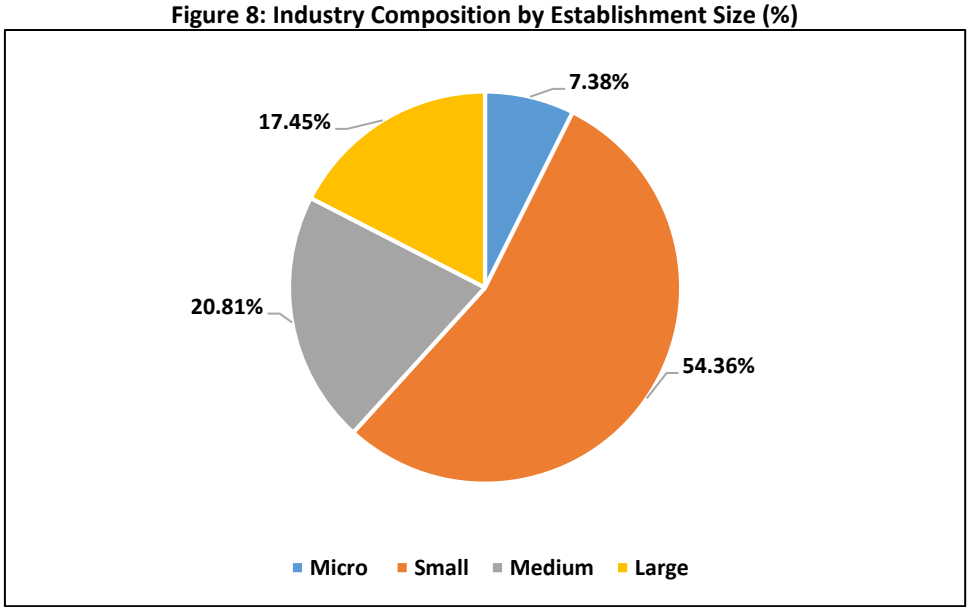
Figure 7: Pharmaceutical Industry's Contribution to % of GDP (Projected up to 2035)



Source: Calculated by Authors based on BBS Statistical Yearbook 2020

According to the Survey of Manufacturing Industry (2019), the industry has a significantly greater share of small and micro-sized firms (Figure 8). However, since enterprise size is defined by the number of workers employed, the distribution of establishment size indicates the high share of capital and technology in the pharmaceutical industry.

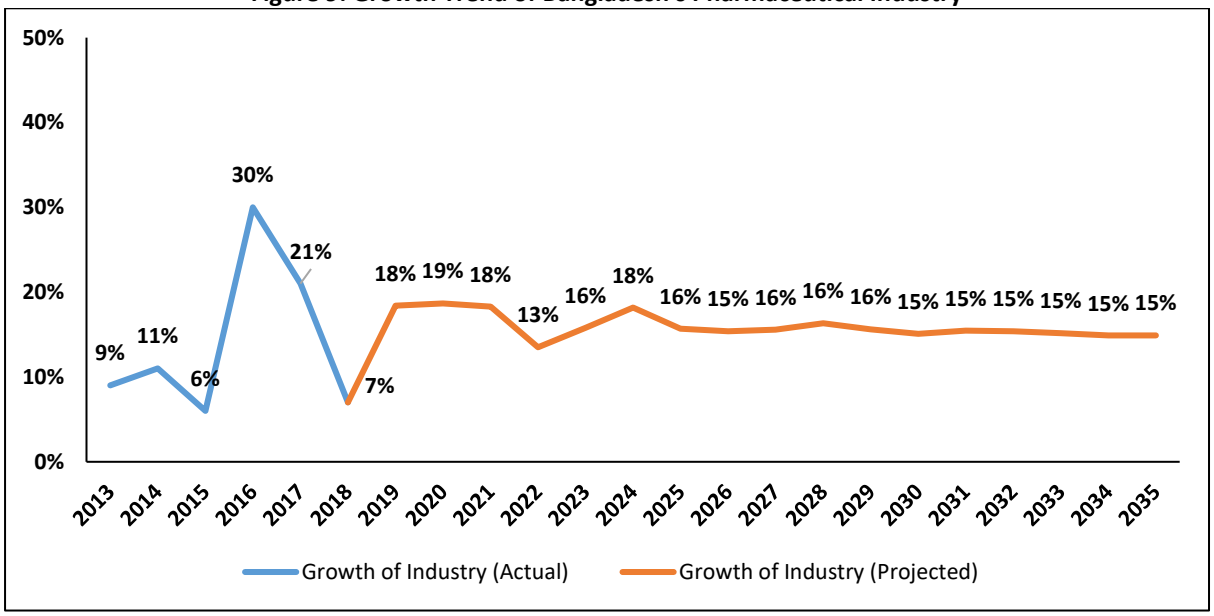
Figure 8: Industry Composition by Establishment Size (%)



Source: SMI, 2019

Nevertheless, driven by the robust growth of the economy and subsequent expansion of the local market along with a vibrant export stream, the pharmaceutical industry has shown significant growth. While there has been a decline in industry growth rate for a brief period between 2016 and 2018, the projection shows that the industry is set to grow roughly at an average rate of 15% over the next decade (Figure 9).

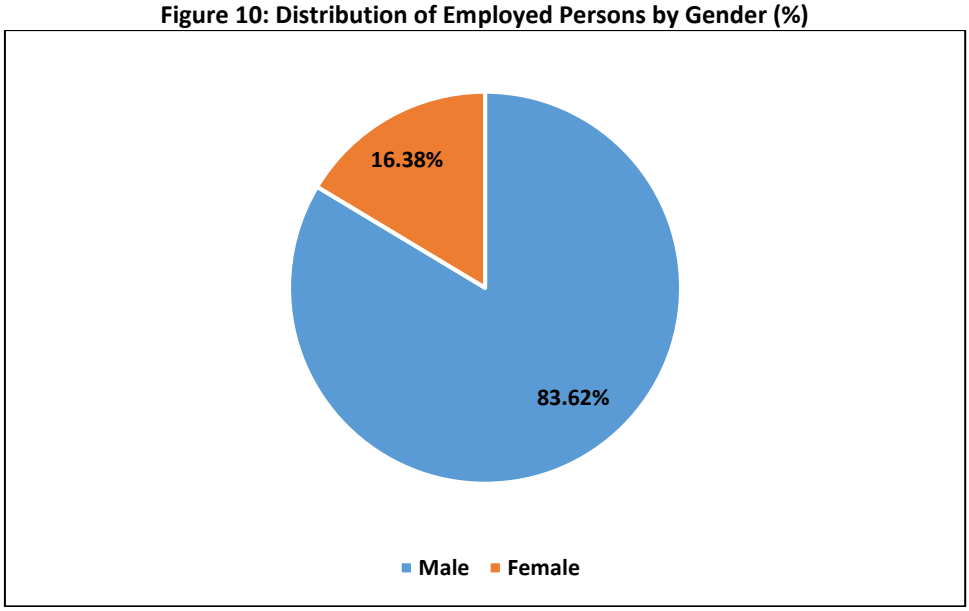
Figure 9: Growth Trend of Bangladesh's Pharmaceutical Industry



Source: IQVIA, 2018 and Authors' calculation

Among the total persons engaged in the pharmaceutical sector, the male to female ratio is almost 3:1. The gender distribution of the industry reflects the low participation of women in the labour force and in particular technologically intensive sectors (Figure 10).

Figure 10: Distribution of Employed Persons by Gender (%)



Source: LFS 2016-17

According to SMI (2019), the majority of this sector's workforce can be defined as production and related workers (28, 561), followed by clerical and sales workers, administrative and managerial workers, and temporary labourers (Table 1). A negligible portion is defined as family helpers. The primary source of manpower for the pharmaceutical industry is the "Pharmacy Faculties" of public and private universities. Given the required level of skill and knowledge, the pharmaceutical industry offers a higher average salary in comparison with other emerging sectors (SMI, 2019).

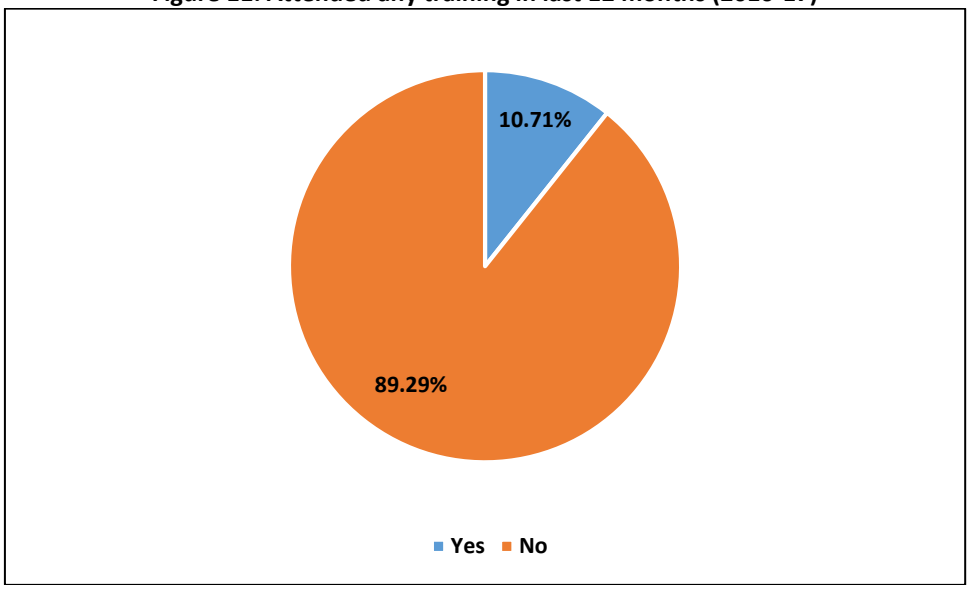
Table 1: Distribution of Persons by Occupation and Gender in the Pharmaceutical Industry

	Owner/ Proprietor/ Partner		Administration & Managerial		Clerical and Sales Workers		Production and related Workers		Temporary Labourer		Family helper	
Gender (Male = M, Female = F)	M	F	M	F	M	F	M	F	M	F	M	F
Number of Persons	389	63	3263	1054	11538	1689	20112	8449	1959	938	3	1

Source: SMI, 2019

There is a serious lack of training among the persons employed in the pharmaceutical sector. This lacking illustrates the industry's need to prioritize capacity building.

Figure 11: Attended any training in last 12 months (2016-17)



Source: LFS 2016-17

3.3 Domestic Policy Support

The pharmaceutical industry has been classified as a "high priority" sector in the Industrial Policy (2016) of the Government of the People's Republic of Bangladesh. Accordingly, certain provisions and policy structures have been designed to facilitate the growth of the industry. Background for further policy support has also been laid down in the policy. Recognizing the potential for export and employment generation of export-oriented manufacturing industries, the Industrial Policy 2016 outlines certain provisions which can greatly accelerate the growth of the pharmaceutical industry:

- Special incentives include cash incentives, tax holidays, bonded warehouse schemes, etc.
- Three years of incentives for investors—starting from the first year of their commercial production
- Special privilege and support from the venture capital/risk fund
- Reduced duty for import of machinery

Notably, the pharmaceutical industry is a knowledge and research-based industry. The competitiveness of the industry depends largely on its capacity for research and development. The Industrial Policy also emphasizes the R&D efforts:

- R&D expenses are eligible for tax holiday facility
- Enhancing the competitiveness of the sector by use of ICT
- Training centres for priority sectors will be set up
- Technology Incumbent Centers have been proposed to be established in various universities, research, and technical institutes
- Special emphasis on vocational education
- Special training for the promotion of corporate leadership

- Creation, conservation, and management of the intellectual property

In congruence with the Industrial Policy, the Export Policy (2018-21) also classifies the Pharmaceutical Sector as the highest priority sector. Moreover, the Export Policy distinguishes manufacturing of Active Pharmaceutical Ingredients (APIs) and laboratory reagents as the highest priority sector. Although the policies show a strong government buy-in, as required for any emerging sector, however, the policy does not address the skill gap issues of the industry.

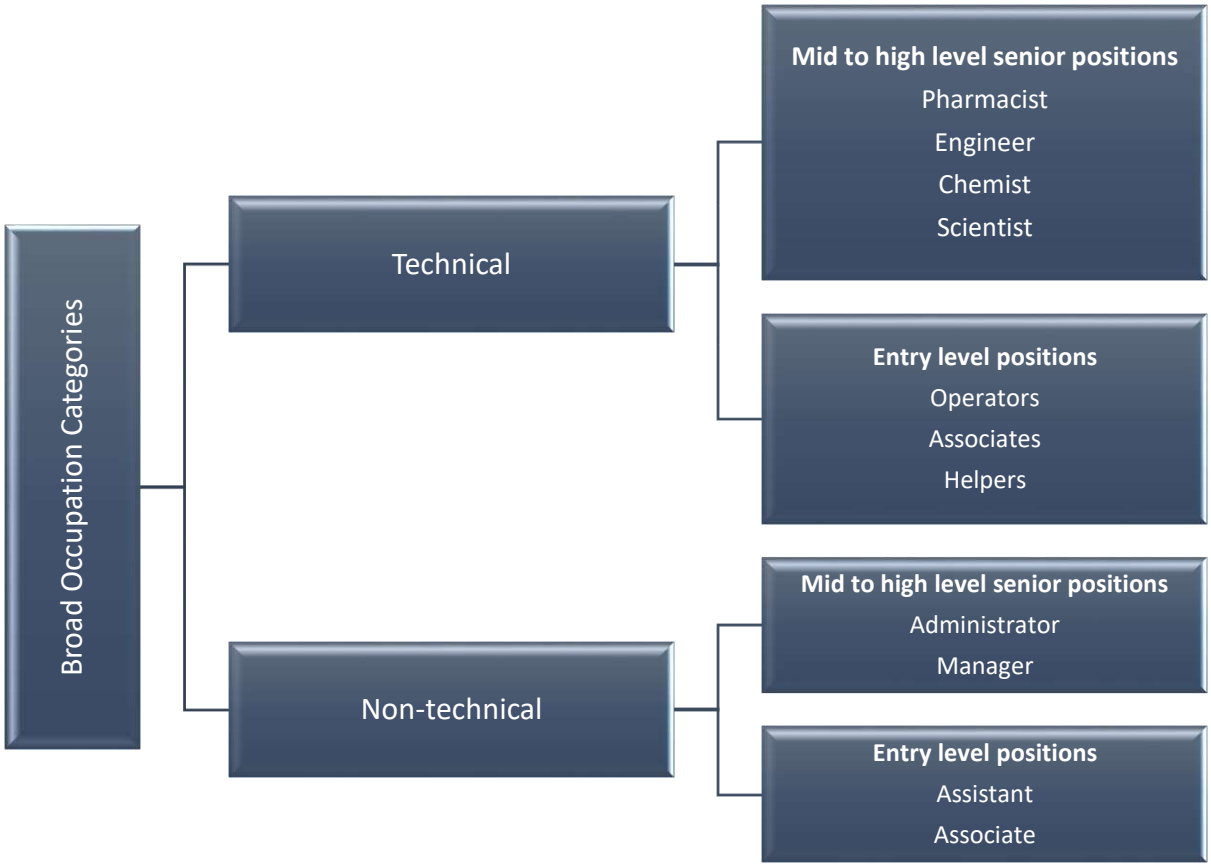
To reduce import dependency and attract foreign investment, the government formulated an API policy in 2018. Among other things, the policy includes provisions for establishing a dedicated API production park. The API policy requires local producers of APIs to invest at least 1% of their annual turnover in Research and Development—which may have some impact on the skill level of the overall labour force in the industry. The policy also aims to establish academic and research institutes to establish a higher level of linkage between industry and academia. However, the policy is yet to be implemented, in terms of such linkage.

4. Findings

4.1 Occupation Structure

The pharmaceutical industry employs broadly two categories of workers/employees at different levels—people with technical skills and people with non-technical administrative or managerial skills. There are further stratifications in and across these two groups. However, the industry vernacular about these groups differs from firm to firm. Based on the KIIs, a general occupation structure common to the pharmaceutical industry has been devised (Figure 12).

Figure 12: Occupation Structure



Source: Compiled by the Authors from Qualitative Survey

At each level and category of this structure, the required level and nature of skills and education are distinct but closely related.

There is demand for both industry-specific expertise and general skills. It should also be noted that these sets of skills are not mutually exclusive and from mid to senior level, there is an increasing demand for candidates with both qualities. Nonetheless, mid to senior-level positions also demand a higher level of experience. Due to the technology-intensive production process and sophisticated marketing strategy for catering to a sensitive customer

base, the industry's minimum requirement for education level is a higher secondary degree. With each step along the hierarchy, the minimum requirement for educational level continues to gradually increase.

According to industry insiders, in the case of entry-level recruitment for the production side, emphasis is given to the candidates' basic understandings of pharmaceutical science, cognitive skills and commitment to the organization. For positions such as helpers or operators or associates, understanding of pharmaceutical science is not deemed essential for recruiters; nevertheless, candidates with a background in science in higher-secondary are preferred.

4.2 Projection of Gap between Labour Supply and Demand

Based on the LFS 2016-17 and SMI 2019, the study team has projected the supply of labour for particular occupations in the pharmaceutical industry (Table 2). For this purpose, the ratio of employment and gross value added (at constant price) by the industry in 2017 was calculated, which was then used to make projections for total employment up till the year 2035. The total employment was then distributed across occupations as categorized in SMI 2019, according to occupation distribution in LFS 2016-17.

Table 2: Projected Labour Supply for Pharmaceutical Industry

Year	Value Addition (Mil. Tk)	Total Employment	Owner/ Partner	Administration & Managerial	Clerical and Sales Workers	Production and related Workers	Temporary Labourer	Family helper
2017	77325.00	177000.00	1617.61	15449.65	47336.71	102213.94	10367.77	14.32
2018	85425.00	195541.22	1787.06	17068.05	52295.36	112921.12	11453.82	15.81
2019	111397.00	254992.16	2330.39	22257.29	68194.86	147252.84	14936.15	20.62
2020	127667.00	292234.84	2670.75	25508.06	78155.00	168759.74	17117.64	23.63
2021	144703.00	331230.92	3027.14	28911.88	88584.08	191279.19	19401.84	26.79
2022	165824.00	379577.73	3468.99	33131.89	101513.90	219198.50	22233.75	30.70
2023	182477.00	417697.11	3817.36	36459.19	111708.51	241211.68	24466.59	33.78
2024	201555.50	461368.55	4216.48	40271.10	123387.96	266431.06	27024.64	37.31
2025	220442.50	504601.65	4611.59	44044.75	134950.18	291397.30	29557.02	40.81
2026	238308.25	545497.06	4985.33	47614.36	145887.21	315013.58	31952.46	44.12
2027	257291.00	588949.33	5382.45	51407.14	157508.04	340106.39	34497.68	47.63
2028	275667.38	631013.58	5766.88	55078.77	168757.67	364397.65	36961.59	51.03
2029	294091.63	673187.42	6152.31	58759.96	180036.60	388752.19	39431.92	54.45
2030	312771.19	715945.69	6543.08	62492.17	191471.83	413444.23	41936.48	57.90
2031	331171.50	758064.73	6928.00	66168.58	202736.10	437767.13	44403.61	61.31
2032	349723.41	800530.78	7316.10	69875.28	214093.18	462290.42	46891.05	64.74
2033	368263.34	842969.44	7703.95	73579.58	225442.94	486797.89	49376.89	68.18
2034	386739.45	885261.99	8090.47	77271.14	236753.62	511220.99	51854.18	71.60
2035	405285.38	927714.34	8478.44	80976.64	248107.03	535736.37	54340.82	75.03

Source: Authors' Estimations based on LFS 2016-17 and SMI 2019

Demand for labour in the pharmaceutical industry has been projected based on the industry's average growth rate of 15% for the next decade, as found in the literature review and later corroborated by the KIIs (Table 3). Total projected employment was estimated on the basis of the ratio of employment to gross value added (at constant price) by the industry in 2017. Based on the LFS 2016-17 distribution of occupations, the projected total employment was disaggregated accordingly.

Table 3: Projected Demand if Industry grows at an average rate of 15%

Year	Value Addition (Mil. Tk)	Total Employment	Owner/ Partner	Administration & Managerial	Clerical and Sales Workers	Production and related Workers	Temporary Labourer	Family helper
2022	165824.00	379577.73	3468.99	33131.89	101513.90	219198.50	22233.75	30.70
2023	190697.60	436514.39	3989.33	38101.67	116740.99	252078.28	25568.81	35.30
2024	219302.24	501991.55	4587.73	43816.93	134252.14	289890.02	29404.13	40.60
2025	252197.58	577290.28	5275.89	50389.46	154389.96	333373.52	33814.75	46.69
2026	290027.21	663883.82	6067.28	57947.88	177548.45	383379.55	38886.96	53.69
2027	333531.29	763466.40	6977.37	66640.07	204180.72	440886.48	44720.01	61.75
2028	383560.99	877986.36	8023.98	76636.08	234807.83	507019.46	51428.01	71.01
2029	441095.14	1009684.31	9227.57	88131.49	270029.00	583072.38	59142.21	81.66
2030	507259.41	1161136.96	10611.71	101351.21	310533.35	670533.23	68013.54	93.91
2031	583348.32	1335307.50	12203.47	116553.89	357113.35	771113.22	78215.57	108.00
2032	670850.57	1535603.62	14033.99	134036.98	410680.36	886780.20	89947.91	124.19
2033	771478.15	1765944.17	16139.08	154142.52	472282.41	1019797.23	103440.10	142.82
2034	887199.87	2030835.79	18559.95	177263.90	543124.77	1172766.81	118956.11	164.25
2035	1020279.85	2335461.16	21343.94	203853.49	624593.49	1348681.84	136799.53	188.88

Source: Authors' Estimations based on LFS 2016-17 and SMI 2019

The gap between projected demand and supply of labour has been estimated to illustrate the labour market challenges for 2035 (Table 4). Of particular importance is the gap in the supply of production and related workers who fall under the "Technical" category in the occupational structure, as this gap, regardless of the aspect of skill level, can cause significant drawbacks to the industry's growth.

Table 4: Gap between projected labour supply and projected labour demand

Year	Total Employment	Owner/ Partner	Administration & Managerial	Clerical and Sales Workers	Production and related Workers	Temporary Labourer	Family helper
2023	18817.28	171.97	1642.49	5032.48	10866.60	1102.22	1.52
2024	40622.99	371.26	3545.83	10864.17	23458.96	2379.49	3.29
2025	72688.63	664.31	6344.71	19439.78	41976.22	4257.73	5.88
2026	118386.76	1081.94	10333.53	31661.24	68365.97	6934.50	9.57
2027	174517.07	1594.92	15232.93	46672.68	100780.09	10222.33	14.11
2028	246972.77	2257.10	21557.31	66050.16	142621.81	14466.42	19.97
2029	336496.88	3075.27	29371.53	89992.40	194320.18	19710.29	27.21
2030	445191.27	4068.63	38859.05	119061.53	257089.00	26077.06	36.01
2031	577242.77	5275.46	50385.32	154377.25	333346.08	33811.97	46.69
2032	735072.84	6717.88	64161.70	196587.17	424489.78	43056.86	59.45

2033	922974.73	8435.13	80562.94	246839.47	532999.34	54063.20	74.65
2034	1145573.80	10469.48	99992.76	306371.16	661545.83	67101.93	92.65
2035	1407746.82	12865.49	122876.85	376486.46	812945.47	82458.70	113.85

Source: Authors' Estimations based on LFS 2016-17 and SMI 2019

4.3 Projected Skill Demand in Pharmaceutical Industry

Based on the KIIs, the required skills and education for each of the categories in the occupation structure can be outlined. KII respondents have suggested that for the pharmaceutical industry to grow at an average rate of 15%, the industry would require approximately 30% of the labour supply to be skilled. In that regard, a projection for the required skilled labour has been estimated which shows that in 2035, at least a total of 160720.91 skilled employees in the technical category and 98725.10 skilled employees in the non-technical category will be required (Table 5).

Table 5: Required Skilled Level Projected for 2035

Category	Occupation	Required Skills	Minimum Required Level of Education	Minimum Required Level of Experience	Skilled Labour Needed in 2035
Technical	Pharmacist	➢ Technical Skill ➢ Understanding of Pharmaceutical Science	Bachelor's Degree/Diploma in Pharmacy	0-3 Years	160720.91
	Engineer	➢ Technical Skill ➢ Scientific Understanding	Bachelor's Degree/ Diploma in Engineering	0-3 Years	
	Chemist	➢ Technical Skill ➢ Understanding of Chemical and Pharmaceutical Science	Bachelor's Degree/ Diploma in Chemistry	0-3 Years	
	Scientist	➢ Technical Skill ➢ Research	Bachelor's Degree/ Diploma in Pharmacy/Engineering/Chemistry/relevant field	0-3 Years	
	Operators	➢ Technical Skill	Higher Secondary Degree from general education/TVET graduate	No prior experience required	
	Associates	➢ Technical Skill	Higher Secondary Degree/ TVET graduate	No prior experience required	
	Helpers	➢ Technical Skill	Higher Secondary Degree/ TVET graduate	No prior experience required	
Non-technical	Administrator	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills ➢ Leadership	Bachelor's Degree in Business Administration/Management/Marketing/ Pharmacy/relevant field	0-3 Years	98725.10
	Manager	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills ➢ Leadership	Bachelor's Degree in Business Administration/Management/Marketing/ Pharmacy/relevant field	0-3 Years	
	Assistant	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills	Bachelor's Degree in Business Administration/Management/Marketing/ relevant field	No prior experience required	
	Associates	➢ Organizational Skill ➢ Communication Skill ➢ Soft Skills	Bachelor's Degree in Business Administration/Management/Marketing/ relevant field	No prior experience required	

Source: Compiled by the Authors

The pharmaceutical industry naturally attracts graduates of pharmacy, chemistry and other relevant subjects of science. Recruiters consider four years of undergraduate training in pharmaceutical science as a basis for further development in expertise and subsequent service to the industry. The general understanding in this regard is that graduates of pharmacy

and other sciences will quickly pick up the necessary skills from on-job training and other programs arranged by the companies. Since the graduates have theoretical training in the production process, exposure to real-life operations should quickly scale their skills up. The graduates are then expected to manage, supervise, monitor and evaluate the production process. As the whole process of medicine production is complex and highly technical, there is no alternative to basic theoretical understanding and hence the primary demand in this regard is a bachelor's degree in the relevant field.

In the case of non-technical occupational groups, graduates of business administration, management and marketing are in higher demand. The recruiters generally expect the new recruitments to have a basic understanding of business operations, organizations, sales and marketing. More importantly, there is a high demand for effective communications and soft skills among employees. The non-technical occupational groups are involved in intra- and inter-company communication, management of supply chain, production units, organization of marketing networks and sales at wholesale and retail levels. Therefore, along with command over tools of office management (i.e. software for computation and writings), the employees are required to be cooperative, receptive, team-player and dedicated to the company vision.

Experience is not necessary for entry-level positions. Naturally, for mid to senior-level positions, candidates with high experience are in greater demand. The occupation structure and demand for skills indicate the core requirements demanded from the newcomers and existing employees.

Although high reliance on technology has led to greater demand for manpower for jobs in the technical category, there is also significant demand for jobs in the non-technical category. Demand for each of the jobs for both categories can be classified as high, medium and low (Table 6).

Table 6: Occupations with higher demand

Category	Occupation	Demand Classification
Technical	Pharmacist	High Demand
	Engineer	High Demand
	Chemist	High Demand
	Scientist	Medium Demand
	Operators	Medium Demand
	Associates	Medium Demand
	Helpers	Low Demand
Non-technical	Administrator	High Demand
	Manager	High Demand
	Assistant	Medium Demand
	Associates	Low Demand

Source: Compiled by the Authors, based on KIIs and literature review

4.4 Mixed Perception on the Skill level of Existing Employees

The KIIs have yielded a mixed reaction from the respondents concerning the skill level of the existing employees in the industry. In interviews of both mid and top-level officials, it was

found that they are more or less satisfied with the current level of skills of employees in the industry. However, in some other interviews, deep concern regarding the current skill level was expressed. It is industry-wide accepted that there is a lack of soft skills across all categories and levels of occupational groups in the pharmaceutical industry.

Industry insiders pointed out that the steady rise of the pharmaceutical industry would not have been possible without a skilled supply of manpower. However, skill level remains a concern as there is a greater scope of development. This becomes more apparent in competition in foreign markets. The respondents established a direct relationship between the growth of the pharmaceutical industry and an increase in skill level. Across all the interviews, it was maintained that there is no alternative to an increase in productivity.

The responses on perception of skill levels can be interpreted based on the informants' assessment of productivity and current and future challenges. In that regard, it can be argued that the current level of skills has been just sufficient in terms of the industry's consistent growth performance. However, taking into account growing challenges and prospects, it can be maintained that the current level of skill is exhibiting a downward trend diverging from the industry demand.

4.5 Apparent Sufficiency in Required Educational Level

It has been found that there is not much lacking in the required educational level among the existing employees and the newly recruited. The recruiters are generally satisfied with the educational level of the employees in both production and management. Given the consistent supply of graduates in pharmaceutical science and other relevant fields, the industry enjoys a stable flow of manpower with a basic understanding of the trade. Since most public and private universities offer courses in business administration, management and marketing, there is also no lacking manpower supply for managerial and administrative positions. An increasing number of TVET graduates are joining the industry at the entry levels—which has also expanded the scope of recruitment.

4.6 Recruiters' Low Expectation

It seems that the recruiters do not have much expectation from the newcomers concerning skills. For the industry stakeholder, it is essential enough that the newcomer has some amount of theoretical foundation in pharmaceutical production. It is not generally expected that the aspirant candidates would also possess some skills regarding the actual process of production and management. In response to questions on expectations from TVET graduates, it was found that the officials have a great appreciation for TVET. Although the TVET graduates and diploma degree holders are supposedly more proficient in practical production processes, even they are not expected to have the primary or basic skills required in production. In the case of entry-level appointments in the position of operators, associates or helpers, the recruiters mostly look for candidates with a background of science in higher-secondary and demonstrated commitment. There are, however, slightly more expectations from candidates for administrative and managerial jobs—the demand for soft skills is higher in this regard.

4.7 Greater Scope and Higher Effectiveness of On-job Training

On-job training is highly valued by the industry stakeholders. As academia offers little scope for graduates to learn practical skills related to production and the opportunity for learning real-life management skills is limited for students of businesses, there is no alternative to learning on the job.

The on-job training offered by the firms is designed specially to meet the firm-specific demands. Training programs gradually progress from orienting a newcomer to the industry standard and protocols and then to building their expertise in production and management. The KIIs pointed out that for each category and level, a modified and tailored training program is implemented. Thus, employees at all levels are brought up to synchronization with the firm's operation. It has been found that, given the ever-involving nature of pharmaceutical science, training programs on different content and varying duration are also frequently held. As the industry stakeholders do not have much expectation of skills from newcomers, they put great emphasis on on-job training.

The KIIs suggested that the training programs are well received and highly effective. The impact of on-job training programs has had far-reaching implications for the whole sector. In dealing with the skill gap scenario, on-job training programs have been the most prominent tool. There is, however, one caveat to be considered—continued arrangement of training programs is expensive. This puts medium and small enterprises in a difficult position, as they face a trade-off between increased cost and skilled employees. There is also the added risk that once trained, an employee would leave the small or medium enterprise for a better opportunity—jeopardizing the enterprise's strategic plan.

4.8 High Appreciation of TVET Graduates

The industry stakeholders highly appreciate the intake of TVET graduates in their respective companies. TVET graduates are valued for their developed sense of practical skills and understanding which can be crucial for the production of pharmaceuticals. In all the KIIs, the respondents expressed their satisfaction with the recruitment of TVET graduates. However, there is greater scope for TVET graduates to be employed in the pharmaceutical industry, which is not being realized currently. The respondents were well aware of the social stigma surrounding TVET and they expressed their concern about addressing such stigma.

4.9 Lack of Linkage between Industry and Academia

There exists virtually no link between the pharmaceutical industry and academia. Pharmaceutical science is a popular subject in both public and private universities. However, industry insiders are rarely consulted on the curriculum or course plan of the faculties. Similar observations were found in the case of the study of chemistry, engineering and TVET. This has created a gap between industry demands and labour supply. The industry stakeholders' low expectations from newcomers and high emphasis on on-job training—can be traced back to this lack of relation between industry and academia. Although, industry stakeholders,

especially experienced personnel are highly interested in collaborating with academia and the government in designing and bringing the curriculum up to date.

4.10 Skilled Employees get Comparatively Higher Salaries

It was unanimously agreed by the interviewees that skilled employees get a comparatively higher level of salary and other benefits in comparison with semi-skilled or unskilled employees. It can be deduced that skill is determining factor for salary level.

4.11 Lacking in Research and Development

Despite the growing need for quality research and development of new products, there is a huge deficiency in this area in the pharmaceutical sector. The enthusiasm of stakeholders in R&D is not being matched by the labour force. The lacking of quality research is partly due to a narrow supply of scientists and researchers.

4.12 Need for Higher Level of Skills to Integrate into the 4IR

The 4th Industrial Revolution in the form of automation and artificial intelligence is already underway. It is realized by the stakeholders that integrating into the 4IR would be the best strategy for the industry—which would require a higher level of skills. The labour force has to be trained and prepared to be able to harness the power of 4IR and channel the productive force in the right direction.

5. Recommendations

The issue of the skill gap in the pharmaceutical industry can be framed by three particular aspects: lack of hard skills, lack of soft skills, lack of government-industry-academia collaboration and effective policy measures. However, discussion of these aspects remains incomplete without a focus on the existing structure of the labour market which suffers from longstanding fault lines. More importantly, the industry responses to skill gap need a thorough evaluation.

Taking into consideration these factors, a set of recommendations has been formulated, based on the suggestions and insights provided by the KII respondents. As industry stakeholders, the respondents primarily discussed short- to mid- term policy strategies. Nevertheless, a long-term and comprehensive approach to skill gap was also touched upon by the respondents. Shortcomings on the part of the private sectors also featured prominently in the KIIs.

As has been indicated in the findings, the responsibility of addressing the issue of skill gap lies equally with the government and the private sector—mandating action each in their own capacity and scope. From conducting evidence based research to adopting innovative policy approaches, the area of collaboration and coordination in this regard is wide and requires careful attention from policymakers.

There is a need for further studies for assessing the skill gap in the pharmaceutical industry. More in-depth, detailed, quantitative and qualitative studies on firms of different sizes and types can yield disaggregated results which can then provide crucial insights. These studies need to delve into the intricate nature of the technical specialities required in the industry so that a more nuanced approach can be taken in relation to skill development. Such an approach holds pertinence with regard to occupations under the technical category, such as pharmacists, chemists and engineers. Taking a closer look into the industry demand for these occupations and the associated labour supply is essential. The behavior of the market players

of the industry needs to be analyzed in the broader context of the international market as well. Understanding the skill level and composition of Bangladesh's competitor countries is highly recommended as it would be crucial to map the path forward.

Addressing the structural issues in the labour market will be crucial. The projected gap in labour demand and supply in the pharmaceutical sector illustrates the structural barriers to securing skilled labour for the industry. To ensure a steady flow of skilled workforce, the role of the government and the industry needs to be enhanced in terms of employment opportunities and interventions in labour supply. In this regard, policies also need to focus on existing information asymmetry in the labour market, so that potential candidates can be sensitized to the prospect of the industry. In this regard, candidates from technical and non-technical background need to be made aware of the skills required in the industry. Designing the incentives for concentration on industry-specific expertise is also necessary for any such policy measure.

Tailoring the TVET curriculum to industry requirements is imperative. There is no alternative to modernizing TVET institutions and their curriculum with a special focus on the pharmaceutical industry. To ensure a skilled workforce for the technical occupations, particularly at the entry level, such a policy measure is essential. The government can also aim to establish TVET institutes dedicated to training on pharmaceutical production and management. Such dedicated establishments will be able to train interested candidates on both theoretical and practical aspects of the industry. This will also relieve private enterprises to some extent from being forced to conduct training for every new recruitment. More importantly, such TVET institutes can widen the scope for collaboration with the industry.

It has been consistently found that there exists virtually no link between academia and the pharmaceutical industry. However, this link is quintessential and tripartite coordination among policymakers, industry leaders and academia can be fruitful in this regard. Associations of pharmaceutical enterprises can take a leading role in this regard. The associations can collaborate with the departments of pharmacy, chemistry and engineering in public and private universities to update their curriculum in a way so that graduates can get a practical understanding of the industry during their undergraduate education. The universities and the associations can also jointly launch hands-on training programs, internship programs, periodic workshops and conferences to better equip the graduates. Such collaborations can provide the graduates with much needed exposure to the inner dynamics of the industry and prepare them accordingly.

Public and private investment in the research of pharmaceuticals is necessary if the skill gap and skill mismatch issues are to be addressed. The ongoing outflow of pharmacy graduates and experts can make greater contributions to research as well as production. However, without government encouragement and private facilitation of extensive research on further modernization of production and cutting-edge innovations, these issues and the overall competitiveness of the sector will be at risk. In order to progress and thrive in the international market, it is highly important for the industry to engage in R&D. Without the industry's active engagement with academia in the areas of API, stoichiometry, formulation techniques and other production technologies, it would not be possible to close the existing skill gap.

While policy regimes are the key to the improvement of skill level in the industry, a lack of consistency in the policy regime can be obstructive to growth. Therefore, there needs to be highly efficient inter-agency cooperation and the continuation of a progressive policy philosophy. Bodies like National Skill Development Authority can play the role of coordinator in this regard. In this way, it can communicate the specific demand of the industry stakeholders to policymakers and help orient policies conducive to skill development. For further upgradation of skills through academia and TVET institutes, these government bodies can act as catalysts—directing education and training policies to meet the skill needs of the industry.

6. Conclusion

The skill gap in the pharmaceutical industry can be traced back to the failure of coordination between academia and industry. However, this is neither the only source of this skill mismatch nor the prime factor. Market dynamics, in particular, the free riding attitude shared by many enterprises has led to partial reluctance on the part of employers to emphasize employer training. Provided the gap in projected demand and supply of workforce, there are other structural aspects of the labour market which also need to be taken into consideration. To keep up with the growth and evolving nature of the international pharmaceutical industry, it is imperative for policymakers and private sector stakeholders to undertake a policy direction that would be able to leverage the growth of the domestic pharmaceutical industry. It is equally important that such policy measures address the concerns of the job aspirants in the pharmaceutical sector.

The issue of the skill gap in the pharmaceutical industry may prove to be quite problematic in the mid to long term, especially as Bangladesh is set to graduate from LDC and its special waiver from patents under the TRIPS framework is to be re-evaluated accordingly. On the other hand, the advent of the fourth industrial revolution will create new challenges in the coming decades. In an increasingly competing world with new dimensions emerging in the global pharmaceutical markets, policymakers need to conduct a comprehensive review of the pharmaceutical industry in terms of the supply of skilled manpower. Evidence-based policies can address and amend the issues affecting the skill level in the pharmaceutical industry. However, the policies have to be tuned to future outlooks and long-term visions.

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Annex 1

Annex 1.1

Table 7: Snapshot of KIIs

Designation of the Informants	Level of Seniority	Interview Mode
Deputy Sales Manager (s)	Mid-level	Online (Zoom Meeting)
COO (s)	High-level	In-person
CEO (s)	High-level	In-person
Assistant Manager, Industrial Relations and Administration (s)	Mid-level	Online (Zoom Meeting)
Deputy Manager, HR & Admin (s)	Mid-level	Over Phone
Head of HR & Admin (s)	High-level	Over Phone
Deputy Manager, Production and Operation (s)	Mid-level	Online (Zoom Meeting)
Manager, Finance (s)	Mid-level	Online (Zoom Meeting)

Annex 1.2

Table 8: Institutions associated with the pharmaceutical industry

Institutions Associated with the Pharmaceutical Industry
1. Bangladesh Association of Pharmaceutical Industries (BAPI)
2. The Pharmacy Council of Bangladesh (PCB)
3. Bangladesh Pharmaceutical Society (BPS)
4. The Directorate General of Drug Administration (DGDA)

Labor Market Study under Skills for Employment Investment Program (SEIP)

Skill Gap in the Plastic Sector of Bangladesh

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Executive Summary

Globally, the plastic sector is going to experience growth in the foreseeable future. In Bangladesh, the sector has also experienced a drastic and accelerated growth rate, regardless of the lack of adequate policy support in the past decade. The global market share is up and the Bangladeshi entrepreneurs are enthusiastically moving forward as well. However, as explained in this paper, the sector requires strong policy level support to realize its potential and diversify the export basket, a buzzword echoed in the discussions regarding the economy. Due to the informality present in the economy of Bangladesh, the plastic sector is yet to grasp the necessity of *'integration and enhancement of capacities and investments in skilled human resources',* while they certainly acknowledge the importance of '*integration and enhancement of capacities and investments in state-of-the-art technology*'. However, during the interviews, the researchers were able to find the perceived issue of the "skill gap" among the entrepreneurs.

This paper, therefore, looked deeper into the "skill gap" issues present in the sector and attempted to recommend solutions. The paper primarily relied on the Key Informant Interviews (KIIs) method to analyze the present scenario of the "skill gap". The research team relied on the sector representative association's members, who are entrepreneurs as well, along with trainers and staff who have the necessary insights regarding the employed labour force.

The plastic sector in Bangladesh is dominated mostly by SMEs, which has resulted in certain labour market features. A key sector restriction is the scarcity of trained technical and management labour. Strengthening the Bangladesh Industrial Technical Assistance Centre and the Bangladesh Institute of Plastic Engineering and Technology will be the quintessential policy direction for addressing the skill gap. In terms of research and development, the collaboration between BPGMEA, BITAC, BIPET, BUET, and Asia Plastics Forum should be expanded. TVET curriculum and educational changes should not be restricted to the manufacture of plastic products. The plastic sector's backward and forward links should be considered.

The Lack of availability of a skilled technical and managerial workforce is a major sector constraint. To mitigate this problem, it is suggested that the Bangladesh Institute of Plastic Engineering and Technology (BIPET) act as a nodal agency for skill up-gradation for the plastics Industry, It should collaborate with foreign institutions and universities of repute, develop CAD/CAM training and certification courses, enable international exposure for industry personnel via technical and techno-managerial courses, and develop an industry-relevant curriculum in discussion with industry leaders. The BIPET also needs to scale up its production of trained manpower several times to provide the support the industry requires.

To address the high turnover rate in the plastics industry, the compensation structure must be revisited. An enhanced compensation structure would not only give a protective cushion against worker turnover, but will also provide long-term leverage. Bangladesh has a lot of potential in the plastic recycling industry. Only a multi-sectoral approach will allow the plastics industry to grasp this massive recycling market.
Given the great potential of the recycling sub-sector and its positive externalities, it is also in the public interest to bring in skilled labour.

1. Introduction

1.1 Background and context[1]

The success story of plastic, a versatile material by nature, began 100 years ago – when the German scientist and Nobel Prize winner Hermann Staudinger launched macromolecular chemistry with a groundbreaking paper. There are many different types of plastics with very different properties for practically any aspect of life, and researchers and manufacturers are opening up ever more possible uses – specially to meet major challenges such as urbanization, feeding the world's growing population and combating climate change. In short: plastics are indispensable for shaping a sustainable future worth living.[2]

The plastic sector is one of the manufacturing sub-sectors in Bangladesh. The sector has been identified as a potential contributing sector for accelerating export growth as well as diversifying the export basket. The plastic industry has emerged as a vibrant industrial sector in Bangladesh during the last two decades. The plastic industry initiated its journey in Bangladesh in the 1960s producing some small products such as toys, bangles, and photo frames. The industry experienced an acceleration in the early 1990s following the adoption of the structural adjustment policy (Ahamed, 2014). Currently, the industry manufactures more complex items at a large scale and uses imported CNC (computer numerical control) machines to manufacture moulds locally (Sadek, 2017).

Plastics are versatile materials. They have good physical properties and economic features such as lightweight, attractive colour, ease of processing, non-rusting property and low cost. As a result, many household and technical items which were used to be made of metal, wood, clay, etc. are now being made of plastics. Over the past couple of years, the industry has seen rapid growth. The industry works as a backward linkage for other sectors like packaging, readymade garment, healthcare, pharmaceutical, food, footwear, construction, electronics, energy generation, automotive, and so on by developing and innovating different products (Mamun et al., 2016). Considering its export potential, the industry has been declared a 'thrust sector' in Bangladesh's Export Policy 2018–2021. According to the Plastics Export Roadmap, "*Bangladesh aims to be among the top 50 largest exporters of plastics (current ranking is 89th) and among the top 25 largest exporters of toys (current ranking is 53rd) and related articles in the world by 2021, through integration and enhancement of capacities and investments in state-of-the-art technology and skilled human resources*"[3].

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[1] The authors of this paper express enormous gratitude towards Bangladesh Plastic Goods Manufacturers & Exporters Association (BPGMEA), a private sector association representing all kinds of plastic goods manufacturers of Bangladesh. The qualitative survey portion relied mostly on the interviews undertaken with the organization's members, including members of the board of directors, and the president of the esteemed organization. The staffs of the organization, some of whom are trainers in Bangladesh Institute of Plastic Engineering and Technology (BIPET), provided important insights for this paper.

[2] https://www.100jahrekunststoffe.de/en/start/

[3] BPGMEA, 2018

However, the sector faces a couple of obstacles including labour force-related issues. Digitalization, globalization, demographic shifts and other changes in work organizations are constantly reshaping skill needs. Human capital development of the labour force has been a challenging issue, especially in the context of the fourth industrial revolution. Job positions remain empty because there are not enough skilled workers. Referred to as the manufacturing skills gap, this issue revolves around the labour market being unable to find workers who have the manual, operational, and highly technical skills, knowledge, or expertise to take the open positions. This paper attempts to understand the skill gap faced by the plastic sector and provide recommendations to overcome them.

1.2 Rationale and Objectives

The main objective of the assignment is to assist the government and the private industry in better planning the capacity and quality of skills training systems according to the evolving skills/trade/market demands from rapidly growing industry sectors.

The second objective of the assignment is to determine sector priorities, assess skills gap by sector, analyze the sector-wise occupational composition of employment (including gender composition of employment), and assess occupation-wise training requirements by sector and trade.

1.3 Overview of the report

The report is divided into five sections. The first section lays down the background and context of the paper. This section further discusses the rationale, objective and conceptual framework of the paper as well. The second section shows the methodological approach. The third section presents an overview of the plastic sector. The fourth section presents the findings from the qualitative survey where industry insiders shared their views regarding the skill gap. The fifth and final section specifies the way forward for the sector in light of the findings from the paper.

1.4 Conceptual framework

The questions asked of each respondent were designed to assess the plastic sector's skill imbalance. As distinct ways of processing and presenting information, skill is classified into three categories: skill gap, skill shortage, and skill mismatch (horizontal and vertical). We have followed this path and categorized the questions accordingly. We didn't try to measure skill level because we were doing a qualitative response, rather we wanted to know how the firms perceived skill level.

1.4.1 Skill gap

It is the employer's opinion of employees at the firm's level as to whether or not workers are capable of doing their relevant tasks and duties if they lack the necessary skills. This type of skill disparity could result in reduced productivity per worker, higher labour costs, higher recruitment and training expenditures, and a negative impact on company profitability.

1.4.2 Skill shortage

It is a circumstance in which a company finds it difficult to fill a vacancy with qualified labour. Firms are compelled to fill vacancies with unskilled personnel if they are unable to reach the requisite level of ability. This issue is also known as a mismatch between the abilities required by employers and the actual skills provided by employees.

1.4.3 Skill mismatch

Skill mismatch arises when there is a difference between the desired level of education and the actual level of education among the employees. If an employer is offered a position that is unrelated to their degree, abilities, or knowledge, it may also be known as a Horizontal mismatch. On the other side, a vertical mismatch occurs when the education necessary for the work falls short of the actual degree of education of employees. The goal of this skill level categorization is to determine the general skill imbalance in the plastic business and to provide the findings from interviews in a more detailed way.

2. Methodology

The paper tried to delve into the qualitative aspect of the skill gap experienced by the sector. To understand the current skill gap in the industry, a qualitative survey was conducted. In line with the qualitative nature of the study, two complementary approaches were adopted by the research team: (i) Desk Research and (ii) Key Informant Interviews (KII).

The desk research focused on the existing literature and policy documents. The specific tool used to dive deep into the research questions was key informant interviews (KIIs). The KIIs were conducted with industry insiders.

To implement the KIIs, the research team followed a systematic approach. From the rigorous desk review, the gaps in the existing information were identified. The gaps were then addressed by approaching the appropriate stakeholders who can provide necessary insights. The research team conducted face-to-face interviews, interviews via virtual platforms, and interviews over telephone calls, due to the ongoing pandemic. The research team formed the survey instrument (the checklist for the semi-structured questionnaire) for the qualitative study in accordance with the standard protocol[4]. The KII transcripts were systematically compiled, organized, and analyzed using qualitative data analysis software such as NVivo.

2.1 Desk research

Extensive desk research was conducted for the study. The desk research focused on existing literature on trend analysis on key indicators of the plastic industry and institutional frameworks in support of the Industry. In this regard, literature on market trends, labour force composition, skill demands and skill mismatch were reviewed. Government policy documents including general policies on industry and export and industry-specific policies were assessed thoroughly.

[4] https://in.sagepub.com/en-in/sas/book/qualitative-research-methods-2

2.2 Key informant interview (KII)

Apart from the desk review, the study uses a qualitative approach to determine whether there is a skill gap in the plastic industry, as a result, key informant interviews (KII) were conducted with some of the country's most notable plastic industry owners to better comprehend and answer the research questions.

Key Informant Interview (KII) is an essential tool for comprehensive qualitative research. A systematic approach was followed in arranging and implementing the KIIs. The KIIs were aimed at investigating the industry stakeholders' perspectives on the skills gap in the plastic Industry, the senior-level executives had the experience and therefore insights on the skill level of the currently employed workers of the industry and also the aspirant candidates, as anticipated by the study team. Furthermore, the questionnaire also looked into the areas which appeared crucial to the study team during the desk research.

Box 1: Bangladesh Plastic Goods Manufacturers and Exporter Association (BPGMEA)

Formal Association of the Plastic Industry (BPGMEA)

Bangladesh Plastic Goods Manufacturers Association (BPGMA) is a private sector association representing the country's total plastic goods industries with more than 700 members. Main activities of the association are to assist the industries related to plastic goods manufacturing. It represents the plastic industry as a whole to deal with matters relating to Government regulations, patent rights, import and export regulations etc. The association serves as a contact point for overseas companies who desire to buy or sell or create a contact in Bangladesh for Plastic products.

Source: BPGMEA, 2022

The interviews were conducted in-person, each consisting of thirty to forty minutes, over consecutive three weeks. Due to the pandemic, the majority of the interviews were performed using various online platforms, including Zoom and WhatsApp. For the sake of maintaining confidentiality, the terms and conditions for the interview were carefully prepared and strictly adhered to. None of the interviews was digitally recorded, and the interviewer was only allowed to transcribe manually. The written content was analyzed to prepare the findings and recommendations.

3. Overview of the sector

In recent years, the domestic production of plastic products has experienced a major drive and, therefore, almost all the plastic goods which were imported in the past are now being made domestically. Given the availability of cheap labour, Bangladesh has a comparative advantage in manufacturing plastic products. Moreover, this cheap labour might enable the sector to focus on the process of recycling plastic products contributing to developing a backward linkage for the industry (Islam, 2014). According to the RCA calculation with ITC

data for the latest year (2020), Bangladesh has a clear advantage in two plastic sub-sector products, 391590 and 390769, at six-digit levels (2.98 and 2.04 respectively).

The global demand for plastic products is also growing steadily at more than 20 per cent yearly since 2007. In the past 50 years, the global use of plastics has grown twenty-fold, and it has been estimated to be at least double in the next 20 years. The current per capita consumption of plastics in the U.S. is 109 kg and in China at 38 kg, India at 11 kg and 5-7 kg in Bangladesh compared to the global average consumption of 50 kg per capita per annum and the developed countries' consumption of 80.0 kg per capita per annum. Although the per capita consumption of plastic in Bangladesh is 5 kg per year, quite low compared to the world average of 30 kg per year, it was expected to increase to 17 kg per year in 2020. Table 1 provides a snapshot of the industry details over the last decade[5]. According to the Survey of Manufacturing Industries (SMI) 2019, the sector provided 5.84 per cent and 7.95 per cent of gross output and gross value added respectively. The number of establishments has reduced during 2012-2019 and the share of SMEs has reduced from 99 per cent to 91.73 per cent.

Table 1: Overview of the plastic sector in Bangladesh

Indicators	2012	2019	2034
Output (Mn USD)	574.17	7,223.24	-
Employees	36750	49,505	3,98,900*
Establishments	1036	943	-
Female employees	9313	12,704	1,08,000*
Value added (Mn USD)	187.59	571.66	-

Source: SMI (various years), BBS and authors' calculation from ILO data
*Projected from ILO data .

Plastic products (chapter 39), which include PVC bags, plastic waste, and others, exported USD 115.28 Mn and the proposed Export Target of 2021-22 is USD 127 Mn (EPB, 2022). The sector's representative association, BPGMEA classified the sector into 29 different subsectors (Annex 1). Box 1 provides a snapshot of the only formal association representing the industry, BPGMEA.

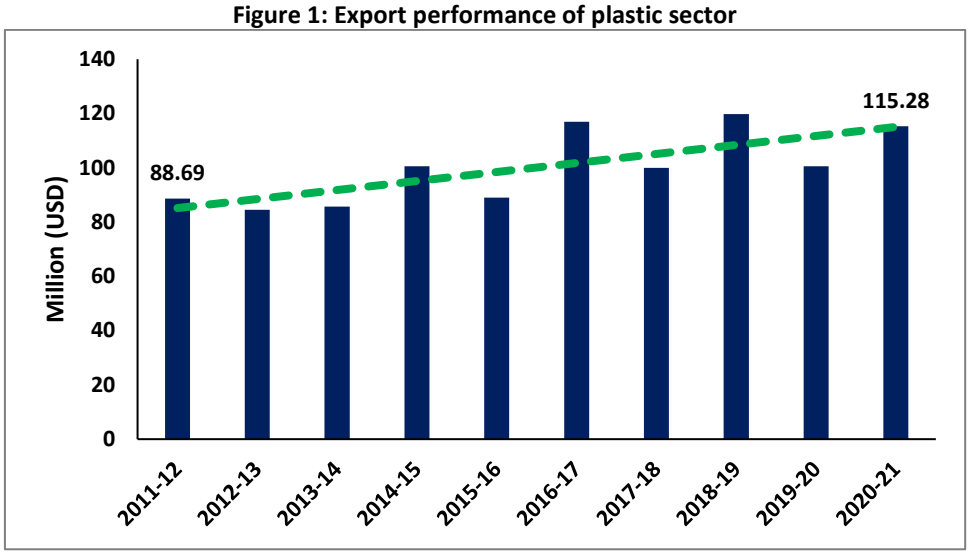
The plastic sector in Bangladesh has been identified as a contributing sector to the acceleration of export growth as well as diversifying the export basket. Over time the sector has experienced a significant increase in the exports of both direct and deemed plastic products. While the exports of direct plastic products have increased from USD 39 Mn in FY 2004-05 to 98.48 in FY 2017-18, the deemed plastic exports have increased from 96 Mn to 900 Mn during the same period[6]. The data of EPB shows that it experienced an 18 per cent fall in the FY 2019-20 due to the pandemic. However, in the FY 2020-21 direct plastics exports marked a 14.68 per cent growth showing the recovery of the sector (Figure 1).

The data of deemed export of plastics products consisting mainly of the packaging and accessories for the readymade garment (RMG) sector is not published by EPB and therefore it is difficult to find out the actual contribution of the deemed exports in the total exports of plastic products. According to an estimate, the deemed plastic exports of Bangladesh were

[5] https://stat.unido.org/database/MINSTAT%202020,%20ISIC%20Revision%204
[6] BPGMEA (2018). Retrieved from: http://www.bpgmea.org.bd/v2/

around USD 900 Mn in FY 2017-18 which is around 90 per cent of the total plastic exports of around USD 1 billion in that year[7].

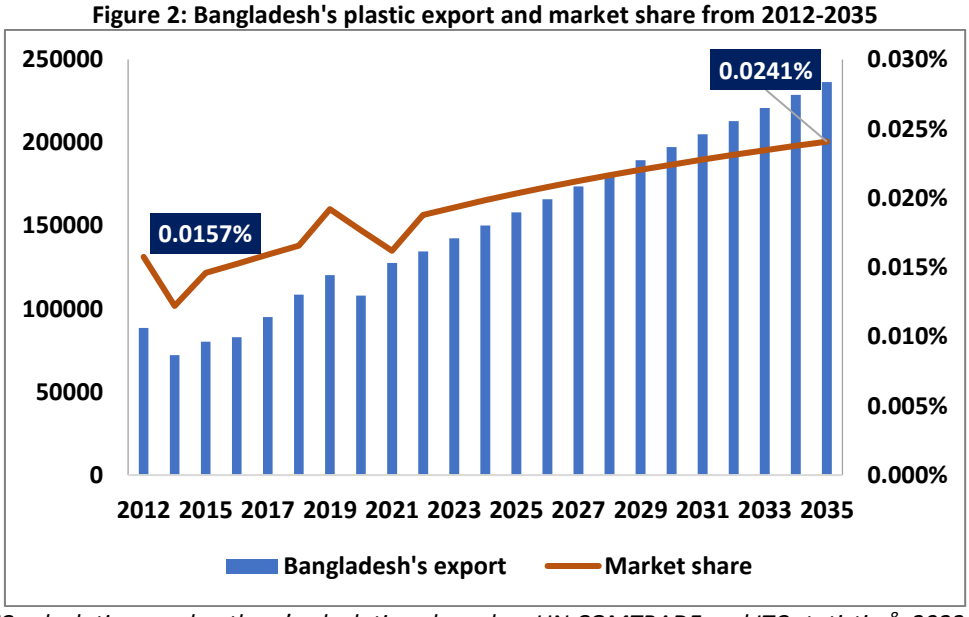
Figure 1: Export performance of plastic sector



Source: EPB, 2022

As discussed previously, according to Plastics Export Roadmap (2018), Bangladesh aimed to be among the top 50 largest exporters of plastics (current ranking is 82nd in 2021) and among the top 25 largest exporters of toys (current ranking is 53rd in 2018) and related articles in the world by 2021, through '*integration and enhancement of capacities and investments in state-of-the-art technology and skilled human resource*'. As Figure 2 depicts, the ITC data and authors' calculation suggests that Bangladesh's export in absolute number, along with market share, are poised to grow steadily until 2035.

Figure 2: Bangladesh's plastic export and market share from 2012-2035

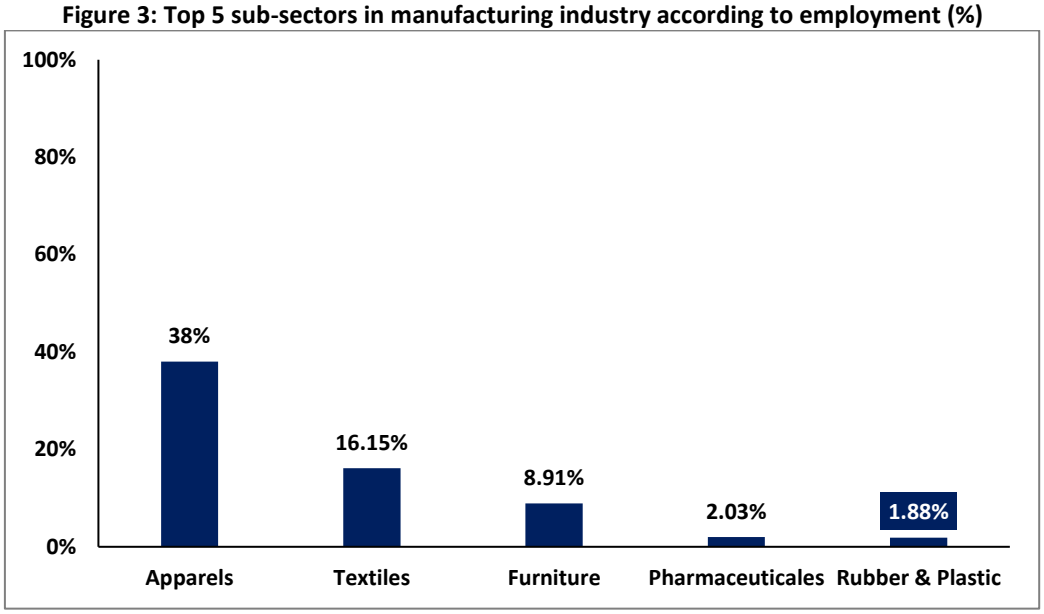


Sources: ITC calculations and authors' calculations based on UN COMTRADE and ITC statistics[8], 2022

[7] https://bida.gov.bd/details/plastics-industry
[8] https://www.trademap.org/

However, the sector could not reach its target as of 2021, as laid out in the roadmap, which requires a closer investigation into the execution of the work plan. According to industry insiders, *integration and enhancement of capacities and investments in state-of-the-art technology* is being implemented, more or less, from the entrepreneurs' side, although inefficiently, due to the information asymmetry that is present in the industry, where government intervention is needed, in absence of a spearheading institution that can connect the industry with the sector frontiers, such as China, Vietnam, and other nations, in a systematic manner.

Figure 3: Top 5 sub-sectors in manufacturing industry according to employment (%)



Source: LFS 2016-17

Nonetheless, the interviews made clear that the idea of skill gap, which was pointed out as the other condition of fulfilling the aims, is not being perceived as crucially as it should have been by the sector insiders. Although they acknowledge the HR capacity of good performers of the sector, due to the presence of an abundance of cheap unskilled labour, they do not quite understand the level of lost productivity due to *'integration and enhancement of capacities and investments in skilled human resource'.* Ironically, such a lack of understanding among the entrepreneurs points out the necessity of vitality of government intervention and support, from the policy level, to groom the private sector and utilization of the sector's potential. This study, therefore, analyzed the skill gap of the labour force of the sector, acknowledging the skill gap of the entrepreneurs as well. The plastic sector employs half a million people and constitutes 1.0 per cent of the national GDP. According to the labour force survey 2016, the sector stands in the top five of the manufacturing sub-sectors that provide employment (Figure 3).

The plastic sector is a capital-intensive one, although being mostly CSMEs due to the number of employees engaged in the enterprises. For instance, most firms consist of 10-50 employees. At present, there are 3000 plastic manufacturing units, 98 per cent of which belong to Small and Medium Enterprises (SMEs). The plastic sector was also declared as one of the thrust sectors in the Industrial Policy of 2010. The present domestic market size is Tk.

7,000 crores. Several plastic items are directly exported to different countries and the total earning for both direct and deem (RMG accessories) exports is about $337 Mn.

4. Findings from the qualitative survey

4.1 Occupational structure

Workers in the plastics sector are roughly classified as production-related workers and other sales, managerial-related workers, regardless of firm size. Production-related jobs include production manager, supervisor or senior operator, assistant operator or semi-operator, and helper. Managerial and administrative-related workers contain broadly clerical and sales, accounts and finance-related employees. The industry's both production and administrative related workers are monitored and administered by the owner of the Industry, the following table is based on the qualitative response and includes the skills, education, and experience required to execute relevant works by various categories of workers (Table 2):

Table 2: Types of occupations in the plastic sector

Occupational types	Required skill	Required Educational qualification	Years of experiences
Production manager	❖ Technical expertise in machinery ❖ Monitoring and planning production process ❖ Supervise the technicians	BSC engineering/ diploma	1 year
Senior operator/Head technician	❖ Technical knowledge of production ❖ Knowledge of machine operating ❖ Leadership skills for supervising workers	SSC	6 months
Assistant Operator/ Junior technician	❖ Machine literacy ❖ Core skill ❖ Communication and problem-solving skills	Class Eight	3 months
Helper	❖ Assisting carpenter and technicians ❖ Literacy and numeracy	No specific requirement	No prior experience
Clerical and sales	❖ Marketing skill ❖ Communication skill ❖ IT Skill	Bachelor of Business Administration (BBA)	6 months
Accounts and finance	❖ IT skill ❖ Numeracy skill ❖ Mathematical skill	Bachelor of Business Administration (BBA)	3 months

Source: Authors' findings from qualitative survey

Typically, production-related work is conducted by one production manager, followed by one head technician/operator, followed by several technicians/semi-operators, and followed by many helpers. The title of each occupation and the number of workers in each occupation differ from one firm to another, according to the firm size (large, medium or small).

4.2 Linkage with other industries

The plastic industry is connected with other industries being a backward linkage industry, for example, it exports around $800 Mn to the garment industry, according to informal sources. The plastic sector has around 28 sub-sectors; such as toys, packaging, consumer products, recycling, electronics parts, and construction materials. Each requires very specific types of machinery, and a skill-set to operate those types of machinery.

4.3 Linkage with academia and TVET

The plastic industry is dependent on machinery and skilled workers rather than depending on manual workers. To ensure more skilled labour, it is essential to ensure the upgrading of skills in processing and manufacturing value-added products and introduce formal institutions for ensuring skill development training. Presently, industry insiders argue that the general academia and TVET are not being able to provide the specific skill-set that the industry needs. Furthermore, the industry is solely relying on on-the-job training, which is time-consuming, and inefficient.

The government agency that is entrusted with providing such support to the industries is named Bangladesh Industrial Technical Assistance Centre (BITAC), which offers training programmes in the machine shop, mechanical drafting, electrical maintenance, welding, pattern making, foundry practice, automobile, auto-electricity, heat-treatment, and electroplating[9]. For the plastics industry, BITAC is the major source of technical training related to mould making. However, the capacity of BITAC in offering dedicated courses on mould making is limited. Currently, no technical institutions are offering dedicated courses related to tool and mould making in the country[10].

Box 2: Bangladesh Institute of Plastic Engineering and Technology (BIPET)

"Bangladesh Institute of Plastic Engineering and Technology (BIPET) was established in 2014 by the initiative of Bangladesh Plastic Goods Manufacturers and Exporter Association (BPGMEA) to create skilled manpower for the Plastic Industry of Bangladesh. BIPET is offering training program and courses – Short Term (Duration: 1 Month, 2 Weeks), Mid Term (Duration: 2 Months) and Long-Term Courses (Duration: 3 years, 4 years). It has collaborations with BPGMEA, Asia Plastics Forum, BITAC, and BUET. The institute is contributing to the Plastic Sector of Bangladesh through development of skilled manpower and designing and developing of innovative plastic products."

Source: http://www.bd-directory.com/

Recently the plastic sector's representative association, BPGMEA has incepted a specialized training institution named Bangladesh Institute of Plastic Engineering and Technology (BIPET), which has trained around 2500 workers so far since its inception in 2014. The institution provides training on subjects such as export marketing course, entrepreneurship development course, marketing management course, production management course, office

[9] http://www.bitac.gov.bd/
[10] BPGMEA, 2018

and human resource management course, e-commerce and online marketing course, branding and marketing for business success course, rules regulations of patent design and trademark course, corporate training on vat course, injection moulding machine operation and maintenance course, extrusion and blow moulding machine operation and maintenance course. However, the institution needs to produce more trained manpower to support the sector, and at the current rate, it is not able to provide the necessary support.

4.4 Present condition of the employed labour force

In Bangladesh, there is a significant opportunity to invest in the plastic sector but there is a lack of investment in skills upgrading or increasing human capital. There is also a huge demand for the skilled labour force but there is a lack of supply of skilled labour. Moreover, there is no demand for unskilled labour in the plastic sector except in helper positions. Comparatively, in the plastic sector, skilled labour has a higher turnover rate and therefore, the cost of labour is higher in the plastic sector. Government should provide adequate subsidies or funding for the students for 10 years to increase human capital.

Plastic sector employees, at the preliminary stage, join a firm at an average of BDT 8,000 in the post titled Assistant Operator at any firm. However, the salary might be as low as BDT 5,000 given the assistant has no prior experience, or the firm is just a startup. The salary increases over time and may go as high as BDT 25,000 on average after a few years. Usually, the operators climb the ladder of management or simply start a new firm after a few years, once they have gained the know-how. The skills gained from hands-on training is the only one that the operators get, the sector is highly specialized in terms of the machines the operators have to operate. However, the upper limit of the salary structure can be stretched as high as BDT 45,000, as an industry insider explained, regarding the second in command of his enterprise, who started his career as a helper. The aforementioned informant was also an operator in some other firm until he founded one of the biggest firms in the toy subsector within eight years.

However, the sector has a high turnover rate, as much as 25 per cent, according to industry insiders, due to the specialized technological know-how required in the sector. While discussing whether a higher salary structure would solve this turnover issue, some of the informants agreed that the salary is much lower than the global frontier countries' pay. Interestingly, an informant tied the salary structure issues with the level of productivity and dedication, which in his words, were lower in Bangladesh, resulting in a lower salary structure. The terms that were used by the aforementioned informant was linked to the skill gap as defined in this paper, which again showed the apparent lack of understanding of the “skill gap” issue among the entrepreneurs, who are lacking the understanding of human resource issues due to the lack of formal training or information, which again resulted into a “skill mismatch” issue in the sector.

4.5 Gender composition of the labour force

Though there are some differences, most of the workers do not want to acquire skills and women workers are better than male workers regarding acquiring skills, and sincerity. But

female workers do not have enough opportunities to work in the plastic sector, except for the toy subsector. Therefore, there is a lack of skilled workers. For manufacturing high-graded or high-value-added plastic products, skilled labour is indispensable. Moreover, there is no database or information about the workers or the necessary skills. Within the structure and facilities of the local industries, the workers should be trained according to the demand and needs. Therefore, a needs assessment is needed to take place to explore which workers need training. Owners of the individual factories should take initiative to provide a skill-related program.

The toy subsector is interestingly a specialized subsector where female workers are preferred, but usually, the cohort leaves the labour force as soon as they get married, leaving a rather well-paid job. This shows the general trend of the female labour force leaving the labour market due to the lack of care economy in Bangladesh[11].

4.6 Artificial intelligence and 4IR

According to industry insiders, the fourth industrial revolution or artificial intelligence will not reduce the demand for labour rather it will open several opportunities. Technological advancement, in terms of better types of machinery, should be welcomed. The benefits of 4IR can only be reaped by the smooth adaptation of technology in the production line.

4.7 Adequate policy support

The industry-friendly policy is the major tool to promote any sector. But in Bangladesh, there is a lack of business-friendly policy. For example, several tariff lines are imposed on the sector, resulting in difficulties in terms of paperwork and red tape, slowing down the exporting process, and making the industry less competitive compared to the competitor countries. The relevant authority of the government does not have the willingness to support the industries through incentives and other support. A business-friendly environment or policy support needs to be taken place by the relevant authority of the government.

However, the Government has initiated a National Plastic Industry Development Policy 2020[12] for the sector, which is appreciated. However, the realization of the mission, vision, aims and objectives will require critical periodic reassessment and recalibration of the action plan for the policy framework. For instance, as of 2022, *establishing dedicated industrial parks in BSCIC Estates or Special Economic Zones for the plastics industry* has not been realized. Also, the process of *encouraging to set up mould-making facilities to cater to the mid and high-end market (Explore PPP and /or FDI joint venture options for the establishment of a central mould-making facility)* is another vital point which needs to be started as soon as possible.

The update regarding the 'Image Survey', and the 'formation of Central Committee for sustainability under BIPET', 'Circular Economy Platform', 'Meet the Buyer's event, 'Counselling program to the industry owners, or the 'State of the Art Plastics Industry

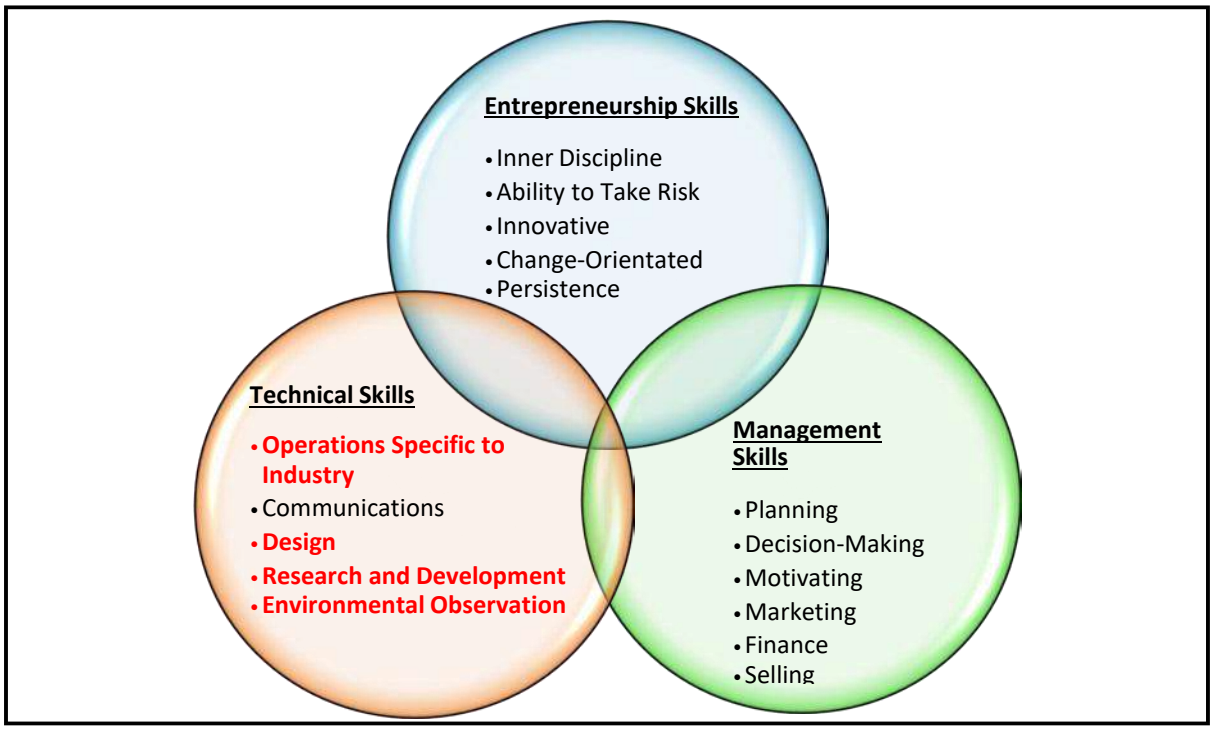
[11] https://sanemnet.org/summary-webinar-on-care-economy/
[12] https://moind.gov.bd/

Development Centre', 'Centres of Excellence' in existing educational and research institutions working in the field of plastics materials, 'Plastic Research and Development Fund (PRDF)', as visualized in the policy documents, are yet to be publicly available as of 2022. The lack of information regarding these promising strategies laid out in the policy document raises the question of timely and effective implementation, which should be conducted transparently as well.

Furthermore, as depicted in the policy document, the BIPET was supposed to *"create an online hub for information on the currently available short courses and graduate/post-graduate courses on necessary technical skills of the plastics industry to meet the current labour skills gap",* whereas, there is no formal website for BIPET as of June 2022. Furthermore, various other schemes and incentives have been laid out in the policy document, which need to be realized and assessed periodically.

4.8 Scope of employment generation by this sector

Figure 4: Entrepreneurship Skill-Sets



Source: Cooney, 2012

There is considerable potential for increasing employment generation by developing more firms in the plastic sector. However, the lack of an industry-friendly policy to support the businessmen or investors curtail such potential. Hence, a business-friendly environment or policy support needs to be taken place by the relevant authority of the government. For instance, according to industry insiders, there is a consensus that the entrepreneurs or the potential entrepreneurs lack technical skills, including knowledge regarding operations specific to the industry (Figure 3). The government agency or window that may have provided the specific knowledge might boost the growth of the sector many-fold, and improve efficiency. At present, the entrepreneurs informally gather knowledge by visiting competitor

countries, or simply going forward by taking an uninformed risk. Furthermore, a wide consensus was present regarding the lack of skill set in terms of designing, mould-making , research and development, among others.

4.9 Relevant institutions in the plastic sector

The institutions relevant to the plastics sector can be categorized into two types: associations and training institutes. There are both exporters' associations and importers' associations. A list of relevant institutions is shown in Table 3.

Table 3: List of institutions

Type	Name
Association	Bangladesh Plastic Goods Manufacturers & Exporters Association (BPGMEA)
	Bangladesh Pet Bottle Manufacturers & Exporters Association (BPFMEA)
	Packaging Industries Association of Bangladesh
	Bangladesh Plastic Importers Association (BPIA)
	Bangladesh Toy Merchants Manufacturers and Importers Association (BTMMIA)
Training institute	National Institute of Packaging & Accessories (NIPA)
	Bangladesh Institute of Plastic Engineering and Technology (BIPET)
	Bangladesh Industrial Technical Assistance Centre (BITAC)

Source: Authors' compilation from various sources

4.10 Future demand structure of occupations

Based on the findings from KIIs, the study listed the occupations based on their demand in the future (high, medium and low demand categories). Table 4 shows the plastic jobs according to these demand categories.

Table 4: Plastic jobs according to demand category

Category	Jobs
High demand	Technician Operator Semi-operator
Medium demand	Production manager
Low demand	Clerk and salesperson Helper Accounts and finance

Source: Authors' compilation from KIIs

There is also a huge demand for the skilled labour force, especially for the positions of head technician, junior technician, operator or semi-operator in the plastic sector of Bangladesh. However, there is a lack of supply of skilled labour. Moreover, there is no demand for unskilled labour in the plastic sector except in helper positions. There is good demand for the skilled production manager, however, jobs are limited for this position and thus it has medium demand. There is also some demand for skilled sales and clerk personnel and accounts and finance managers.

5. Recommendations and Conclusion

The plastic industry in Bangladesh is mostly dominated by SMEs, which has created some distinctive dimensions with regard to the labour market. Due to the country's overall business

environment, SMEs already face hurdles in sustaining business and embarking on a growth trajectory. A range of issues including access to the credit market, lack of government support and growing international competition, affect the enterprises in the plastic industry in terms of building comparative advantage and improving overall productivity. In the short to mid-term, the enterprises face considerable challenges in upskilling the workers. Therefore, the first and foremost issue concerning the skill gap in the plastic industry lies with the internal capacity of the enterprises. In this regard, it is highly recommended that the government extends financial and institutional support to these enterprises and make arrangements which will provide incentives for the enterprises to increase investment in workers' training. These supports and incentives can be provided in the form of subsidies or flexible credit terms. Furthermore, a comprehensive approach on the part of the government will be necessary, through which the enterprises will be engaged in a meaningful way to contribute to skill development. To some extent, these policies may also mend the labour market distortions which arise out of the free-riding tendencies of firms. The lack of availability of a skilled technical and managerial workforce is a major sector constraint.

There is no alternative to strengthening the Bangladesh Industrial Technical Assistance Centre (BITAC) and Bangladesh Institute of Plastic Engineering and Technology (BIPET), which offer specialized training programmes (machine shop, mechanical drafting, electrical maintenance, welding, pattern making, foundry practice, automobile, auto-electricity, heat-treatment, and electroplating). However, it is noteworthy that the curriculum followed in these institutions is not keeping pace with the technological innovations and novel manufacturing techniques in competitor countries. In this regard, it is essential that this curriculum incorporates Computer Assisted Designing (CAD) and Computer Assisted Manufacturing (CAM). While the informants interviewed did not press any concern regarding the fourth industrial revolution, the BIPET and BITAC need to build preparedness in this regard through capacity building workshops and conferences. More importantly, these institutions need to sensitize industry stakeholders to the employment elasticity of automation and artificial intelligence.

While the collaboration among BPGMEA, BITAC, BIPET, BUET and Asia Plastics Forum is highly appreciative, the scope of this collaboration needs to widen in terms of research and development. BIPET can act as a nodal agency in this collaboration. This network of collaboration should also include other TVET institutions. In this regard, the educational structure of general TVET institutions needs to emphasize the skills required in the plastic industry. The collaborations can range from expert consultation on curriculum, hands-on training to internship programs, part-time apprenticeships, and more exposure to the production management process.

The curriculum and educational reforms of TVET, however, should not only be limited to plastic product manufacturing. Backward and forward linkages of the plastic sector should be kept in mind while redesigning the curriculum of TVET institutions that are providing training for plastic sector workers. A specialized curriculum to address the special skill-sets required in the plastic sub-sectors can help narrow the skill gap in this sector as a whole.

Revisiting the salary structure is essential to address the high turnover rate in the plastic sector. Low salary eventually translates into a high turnover rate among the skilled workers which further raises the production cost and hampers productivity. If enterprises can provide

the right incentives and retain skilled workers then it would be conducive to the growth and sustainability of the enterprises and the industry as a whole. However, in redesigning the salary structure the enterprises need to prioritise skilled labour and ensure that potential candidates also grow an interest in the industry. An improved salary structure will not only provide a preventive cushion to worker turnover but also create leverages for the long term.

Bangladesh has a huge potential in the plastic recycling sub-sector. About 646 tons of plastic waste is collected daily in Dhaka while only 37.2 per cent of the plastic waste in Dhaka is recycled[13]. National Action Plan for Sustainable Plastic Management sets a target of recycling 50 per cent of plastics by 2025 and reducing plastic waste generation by 30 per cent by 2030. The plastic sector can only capture this huge recycling market through a proper multisectoral approach. Provided the huge potential of the recycling sub-sector and its positive externalities, it is also in the public interest that a skilled labour force is inducted here.

[13] https://www.worldbank.org/en/news/feature/2021/12/23/meeting-bangladesh-s-plastic-challenge-through-a-multisectoral-approach

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Annex: 1

SL	Plastic Subsector	Products	Name of Companies	Remarks
1	Household Product	Tableware, Kitchenware, Bathtub, Jug, Mug. Bucket, Container, Box, Plate, Glass, Spoon, Soap Case, Toilet Brush, Pan, Clock etc.	Bengal Plastic Ltd., RFL Plastic Ltd., Taj Plastic, Bikrompur Plastic,	Now exporting 11Mn USD but has capacity to export more. Also, high possibilities of export.
2	Furniture Products	Chair, Table, Stool, Wardrobe, Rak etc.	Bengal Plastic Ltd. RFL Plastic, Bikrompur Plastic, Padma Plastic, Taj Plastic	Has export capabilities of the subsector.
3	PVC Pipe and Fittings		Bengal Plastic Ltd. RFL Plastic, Bikrompur, National Polymar, Lira Group, Matadoor Group, Navana Plastic, BRB Plastic, Modina Plastic, Anower Polymar Ltd.	Already many manufacturing industries existing and has capacities to export.
4	Flexible Packaging	Plastic Containers for food and non-food products; packages for retail sale; cosmetics and industrial packages; woven sacks, garbage bags, butcher, bags, industrial films, polythene, sheets, plastic hangers, gloves, ropes, freezer bags etc.	Bengal Group, Famous Group, Brac Printing Pack, Ideal Printing, Arbab Poly Pack, Unicorn Industry, Ltd., The Marchant Ltd, Mantaka Printing and Packaging	Already many manufacturing industries existing and has capacities to export.
5	Building Materials	Door, windows frame, PVC pipes, PVC fittings, electronic cables, electronic switches, water tanks, etc.	Lira Group, RFL Plastic, National Polymer, Partex Plastic, United Door	
6	Engineering Parts and Industrial Parts	Cone, bobbin, silver can, screw, containers, drums, plastic spare parts for machinery etc.		
7	Disposable Plastic Product	Glasses, cups, spoons, containers, biscuit trays, food trays, blister packaging etc.	Shwrid Industry, Ltd., Mise, RFL Plastic, FM Plastic, Mutual Fome and Table Ware Industry, Res Plastic Industry, Sul Packaging	
8	Electric Components	Switch, plaque, holder, multi plague, regulator, cables, etc.	Kitty Industry Ltd., RFL Plastic, Walton	

SL	Plastic Subsector	Products	Name of Companies	Remarks
	and Accessories			
9	Electronics Components and Accessories	Calculator, fridge and tv parts etc.	Walton	
10	Automobile Spare and Accessories	Back light spoke light, etc.		
11	Film and Sheets	Building material, Agricultural, etc.	Growbiz Industry, Ltd. Jambo Multimude, etc.	
12	Pharmaceutical Packaging Products	Blood bag. saline bag etc.	Luna, Plastocats Industry, Ltd. etc.	
13	Health Care Products	Medicine container, injection syringe	Acme	
14	Bag and Sactes of PP Woven, Non Woven		Yeakin Polymar, Khan Brothers, Bengal Group, Sinobangla Industry, Ltd.	178 industries in production and has capacity to cater to the export market. Has high possibilities.
15	Bottle and Container	Cosmetic Container, water bottle etc.	Astec Ltd, Padma Group, Luna Plastic	
16	Engineering Plastic		Navana, RFL	
17	Toys of Plastic	Doll, Ball, YeoYeo, Car, Mask, etc.	Golden Industry Ltd. Subit Plastic Industry, Aman Plastic Industry,	

SL	Plastic Subsector	Products	Name of Companies	Remarks
18	Plastic Sheet for Agriculture Green Home	Drum seeder, shading nets, poly sheeting, film etc.	Munshigong Fiber	
19	Melamine table ware	Plate, mug, glasses, spoons, trays etc.	Bangladesh Melamine, Sharif Melamine, Quality Melamine, Diamond Melamine, etc.	Has export capabilities of the subsector and already exporting
20	Travel Luggage			
21	Pet Recycle and Export			
22	Office File and Stationary	File, marker, clip board, display book, document Case, duster, geometry box, lid card holder, pen stand, all kind of ball pen, sharpener, organizer tray etc.	Matador Group, RFL Plastic, GO Group.	
23	Water Sewage Pipe		Bengal Group, Matador group, Navana group, RLF Plastic, BRB Group, etc.	
24	Comb. Ladies' hair Band and fashion Items			
25	Ball Point Pen		Alpha, Matador Group, GQ Group.	Has export capabilities
26	Garment Accessories	Zipper, button, labels, hangers, polybag, clip, etc.	Bonito Button, Bengal Group, Partex Group, RFL Plastic, etc.	Already exporting more than 700 Mn$ as deemed export and products of international standard. Has huge export possibilities.
27	Plastic Slipper Sandal Shoes			
28	Battery Casing		Rahim Afroz, Navana, Hamko, Volvo, etc.	

SL	Plastic Subsector	Products	Name of Companies	Remarks
29	PVC Compounding			

Source: BPGMEA, 2021

Labour Market Study under Skills for Employment Investment Program (SEIP)

Skill Gap in the Renewable Energy Sector in Bangladesh

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Abbreviations and Acronyms

SREDA	: Sustainable and Renewable Energy Development Authority
IDCOL	: Infrastructure Development Company Limited
SDGs	: Sustainable Development Goals
R&D	: Research & Development
GoB	: Government of Bangladesh
GDP	: Gross Domestic Products
SEIP	: Skills for Employment Investment Program
BSREA	: Bangladesh Solar and Renewable Energy Association
KIIs	: Key Informant Interviews
TVET	: Technical and Vocational Education and Training
UNESCO	: United Nations Educational, Scientific and Cultural Organization
SREDA	: Sustainable and Renewable Energy Development Authority
4IR	: Fourth Industrial Revolution
BSREA	: Bangladesh Solar and Renewable Energy Association
SMMAB	: Solar Module Manufacturers Association of Bangladesh
UCEP	: Unprvilaged Children's Educational Programs
ICETR	: Institute for Clean Energy Training and Research
IFRD	: Institute of Fuel Research and Development
IEPT	: Institute of Environment and Power Technology
CSER	: Center for Sustainable Energy Research
CER	: Centre for Energy Research
CES	: Centre for Energy Studies
UNDP	: United Nations Development Program
NGOs	: Non-Government Organizations
NPOs	: Non-Profit Organizations
STEM	: Science, Technology, Engineering, and Mathematics
NDCs	: Nationally Determined Contributions
PES	: Planned Energy Scenario

Executive Summary

Global employment in renewable energy was estimated to reach 12 million in 2020, up from 11.5 million in 2019 (IRENA, 2021). The renewable energy sector is ranked 8th among the 24 "Priority Sectors" in Bangladesh's National Industrial Policy 2016. Priority will be given to foreign investment and expatriate Bangladeshi investment in setting up renewable energy-based power plants. Renewable energy reduces poverty through increasing access to energy, which allows for the establishment of new enterprises with job creation possibilities for the poor, reinforced by financial inclusion. Bangladesh is ranked 5th among 161 countries in creating employment in solar photovoltaic power industry. Solar jobs are concentrated in 5.8 million installations of off-grid solar home systems. The Sustainable and Renewable Energy Development Authority (SREDA) is formed to control global warming, reduce the risk of natural disasters and ensure energy security in Bangladesh. Bangladesh currently has renewable energy installed capacity of around 788.76 MW, only around 3% of total energy is produced from renewable sources. This must be raised during the 8FYP, according to the GoB (GED, 2020), Bangladesh needs to achieve the SDG target of 10% share of renewable in total energy by 2030.

Solar energy is currently the most promising of the various renewable energy sources in Bangladesh. About 6 million solar home systems have been installed so far and the number is increasing due to the integrated program adopted by the government through the non-bank financial institution, IDCOL.Till now, Biogas and biomass have limited use in Bangladesh. Bangladesh imports 6% of the present power generation capacity which is 1,160 MW (BPDB, 2022). Due to a lack of suitable land, the implementation of renewable energies on a wide scale in Bangladesh is restricted. To accommodate anticipated future demand, Bangladesh needs more advanced research facilities as well as trained workforce. in solar industry .

There is a significant gap in the skills and education required for the industry. Design engineering jobs in solar photovoltaic power industry are predominantly highly skilled and permanent while most are semi-skilled in construction and operations. The suppliers of renewable energy need more experts, skilled engineers and technicians, according to industry insiders. A high rate of job turnover due to the absence of job security, training programs, job benefits and so forth is present in this sector. The stigmatization resulting from the informal nature of employment, and subsequent family pressure is demotivating young graduates from tertiary educational institutes. There is no specific department for Renewable Energy Engineering in the universities of Bangladesh. Employers prefer hiring unskilled workers and providing them with short trainings to equip them to start work. Hands-on training is more common than certified training in this subsector. However, trainings are arranged regularly by some of the firms for up-skilling. The existing firms are able to ensure effective training programs for the workers, according to the stakeholders. There are mainly two types of training categories, field-based and in-house training as needed by the firm. Hands-on trainings are more common for small companies in the renewable energy sector. The technical education system can play a role to produce skilled labour force. Adequate laboratory, infrastructure, and investment are required to scale up from assembly-line to innovative solutions. The lack of R&D-related skills and funding in the research and development department of this sector is a major concern. There is immense potential in the renewable energy sector as it is environment friendly. In the next 10 years, the energy sector will boost up and need many more engineers and researchers. Government should undertake more initiatives to increase skilled labour who can use mobile apps in the process of digitalization. Despite being on the priority list of GoB, the demand for renewable energy has not increased. After sales service quality is very low which reduces user satisfaction and the market is hampered overall. Proper implementation of policies also needs to be addressed for this sector to gain momentum.

According to the projection of this study, Bangladesh will have 2.82 lakhs of renewable energy jobs by 2035. At present, there are 1.1 lakh jobs in the solar photovoltaic power industry in

Bangladesh which is projected to reach 2.42 lakhs by 2035. Around 1.55 lakhs of them would require short training linked with certification, and 75 thousand others would need to be from a STEM background.

The unavailability of employment data is hindering the development of necessary action plans for the skill development in the sector. The government may emphasize the collection of quality data regarding the employment scenario of the renewable energy sector. If the skill gap and mismatch concerns are to be addressed, public and private investment in research and development of this sector are crucial. Government should focus on on-grid renewable energy besides off-grid to meet the energy demand and to better compete with the non-renewable sources of energy. Solar is still the most dominant sub-sector in the renewable energy sector while the country is still lagging in the smaller subsectors like wind and biomass, which often remain unnoticed. The pandemic affected this sector extensively. Many firms limited their operations and scaled down their production. Government support is needed not only for skill development but also for the overall growth of this sector. The government should explore all the opportunities and scopes to expand the sector as much as possible. Proper implementation of the relevant policies such as Renewable Energy Policy and Industrial Policy should be prioritized.

The skills of the workers in this sector are at the bottom of the priority list of this sector's stakeholders due to the apparent lack of demand in the sector. However, a skill gap can still be an alarming issue in this sector from the perspective of the emerging fourth industrial revolution and LDC graduation of the country if not addressed timely. More in-depth quantitative investigations on certain categories of firm size and type can produce critical insights.

1. Introduction

1.1 Background and Context

Bangladesh has been experiencing more than 7% GDP growth from FY 2015-16 until the onset of the pandemic. The economy of Bangladesh largely relies on the ready-made garments sector (RMG), along with other industry subsectors, and the agricultural sector, for the majority of its employment generation. The progress of these sectors is dependent on the uninterrupted supply of power, such as electricity, among other factors. Therefore, to continue the high GDP growth, it is necessary to ensure adequate electricity by increasing the electricity production rate. Around 97.8% of the people in the urban area and 90.7% in rural areas have access to electricity. Overall, 92.2% have access to electricity at the national level (MICS, 2019). Against this backdrop, power generation from renewable sources can play a crucial role to meet the upward demand for energy in Bangladesh.

With positive indicators that energy is becoming more sustainable and broadly available, the world is making progress toward SDG 7. In poorer countries, access to power has begun to increase, energy efficiency is improving, and renewable energy is making significant progress in the electricity industry. Bangladesh's goal of achieving SDG 7 by 2030 needs a constant increase in clean energy, which is likely the most difficult hurdle. Reconciling growing energy demand with low carbon emissions will necessitate a reduction in fossil fuel consumption and a greater dependence on clean technology and renewable energy. Bangladesh is an energy importer, and increased demand would put a strain on the country's balance of payments and budget. As a result, efficient use of energy resources and proper pricing will become more important. The government has set a goal of producing 5% of the total electricity supply from renewable energy sources by 2015, and 10% by 2020. Although the government has launched several renewable energy programs to reach this goal, it could not.

The geographical position and natural resources of Bangladesh are suitable enough to produce energy from sources like solar, wind, hydro, biomass, and biogas. This huge potential creates a win-win situation by reducing environmental degradation and fossil fuel exhaustion at the same time. Till January 2022, for instance, renewable energy generation reduced carbon emission by $4MtCO_2$ in Bangladesh (SREDA, 2022). Due to the energy transition from non-renewable sources to renewable sources, at least 24 million jobs are estimated to be created by 2030 in renewable energy sectors around the world offsetting the job loss of 7 million in the fossil fuel industry (ILO, 2021). On the other hand, the high population growth rate, difficulty in doing business, informality in the labour market, and weak institutions can hinder job growth in Bangladesh. Therefore, creating a substantial number of jobs in the sub-sector seems to be too ambitious or a strong desire to achieve. Around 1.27 lakhs of people are currently employed in the renewable energy sector in Bangladesh, as estimated by International Renewable Energy Agency (IRENA, 2021). However, skill development issue hampers this transition to be smooth because generating power from renewable sources requires sophisticated technology application.

1.2 Objective

The renewable energy sector has already been identified by SEIP as a promising sector with a high skill demand. The objective of this paper is to conduct an in-depth qualitative analysis to capture the skill mismatch and highlight the demand for skills in this sector in near future. The specific objectives are:

1. To prepare an overview of the Renewable Energy sector with a detailed breakdown of its sub-sectors along with a special emphasis on employment;
2. To conduct in-depth interviews with the relevant stakeholders (Private company, Non-Governmental Organization, Non-Profit Organization, Association) to understand the

prospect as well as the current and future challenges in this sector with special emphasis on skill mismatch; and

3. To perform a rigorous qualitative analysis of the renewable energy sector focusing on skill demand and supply, and skill mismatch. This includes the occupational composition of employment based on the major tasks and required skills in the sector and occupation-wise current skill development programs and training requirements in the future.

1.3 Overview of the Report

The report starts with the background and context of the study along with the specific objectives. The next sections will follow with a conceptual framework of relevant keywords, a brief methodology of the secondary data analysis and key informant interviews (KIIs), an overview of the renewable energy sector with a detailed breakdown of its sub-sectors along with a special emphasis on employment, and a rigorous analysis of the qualitative findings. The paper concludes with suggested policy implications and concluding remarks.

1.4 Conceptual Framework

1.4.1 Definition of Skill

Skills can be categorized into two types: soft skills vs hard skills. Hard skill refers to the learned ability to perform job-specific tasks. It requires education and practice to acquire and enhance hard skills. A certificate/degree, training, apprenticeship, and experience can signal as hard skill competency. Soft skill refers to behaviour and personality traits or activities related to cognitive ability such as teamwork, leadership, communication, negotiation, critical thinking and reasoning, work ethic, time management, work under pressure, multitasking ability, etc. This paper focuses on hard skills that include technical, analytical, marketing, management skills, etc.

1.4.2 Definition of Skill Mismatch

The imbalance between skills offered and skills needed in the labour market. The skill mismatch can be of various types including vertical and horizontal mismatch, skill gap, and skill shortage (Table 1).

Table 1: Types of Skill Mismatch

Type	Definition	Description
Vertical mismatch	Over-education or under-education	The degree to which workers' actual education levels are above (over-education) or below (under-education) to those desired/necessary for their present occupations
Horizontal mismatch	The mismatch between workers' major fields of study and the skills needed for their present occupations	Workers are hired for jobs that are not aligned with their education, skills, or expertise
Skill gap	Employers' perceptions of employees' abilities	It assesses the extent to which employees lack the necessary skills to fulfil their existing job obligations successfully.
Skill Shortage	Difficult to find qualified employees with certain skills to fill job vacancies	At equilibrium wage, the existing supply of skills cannot meet the demand for skills by employers. Employers are obliged to hire individuals who are underqualified for the job.

Source: Authors' compilation from various sources

1.4.3 Skill Development Pathways

On-the-job training (workers can be hired with no specialist qualifications and trained on-site by employers); vocational training (this includes both vocational courses and specialized short courses); university degrees (e.g., bachelor's, master's, and doctoral level degrees); and apprenticeships (qualifications delivered in partnership between education institutions and employers) are the key pathways for the delivery of transition skills, especially for the renewable energy sector (IRENA, 2021).

1.4.4 Technical and Vocational Education and Training (TVET)

According to UNESCO, TVET is defined as "those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupation in various sectors of economic life". TVET is defined as education, training, and skill development in a variety of vocational domains, as well as production, services, and livelihoods. As part of lifelong learning, TVET can occur at the secondary, post-secondary, and tertiary levels, and involves work-based learning as well as ongoing training and professional development that can lead to certification.[1]

1.4.5 Fourth Industrial Revolution

For the fourth time in history, the world is undergoing another industrial revolution, this time characterized by fast technical advancement and the rise of automation in many industrial activities. The changing pattern of human-technology interaction as a result of the Industrial Revolution 4.0 (4IR) will certainly have an impact on job creation. Recent economic debates have focused on how to manage rising employment difficulties to maximize the benefits of 4IR. For a developing country like Bangladesh, the worries are much more pressing. 4IR is designed to shift labour demand from low-skilled employees to high-skilled employees. Since the bulk of Bangladesh's employees is low-skilled or semi-skilled, this result might become a considerable concern for the country's economy if it is not addressed. Time necessitates in-depth research of future skill demands in Bangladesh for better preparation regarding the 4IR.

[1] UNESCO (https://unevoc.unesco.org/home/TVET)

2. Methodology

In keeping with the qualitative nature of the study, the research team used two complementary approaches: (i) desk research and (ii) key informant interviews (KII).

2.1 Desk Review

The existing literature and policy papers were the focus of the desk research. For the overview of the sector, the study conducted a thorough review of all key relevant documents including government statistics, relevant websites, reports, research papers, and journal articles in a systematic manner.

2.2 Key Informant Interviews (KII)

Key Informant Interviews (KII) refers to the qualitative in-depth interviews with relevant stakeholders. A listing of the stakeholders has been prepared with the help of the websites of Bangladesh Solar and Renewable Energy Association (BSREA), Sustainable and Renewable Energy Development Authority (SREDA), and Infrastructure Development Company Limited (IDCOL), and other relevant sources. A list of relevant institutions is shown in Table 2. At first, 25 randomly selected stakeholders, with the highest possible diversity, have been contacted. Annexe 1 shows the snapshot of KIIs, types of the stakeholder on which the KII was performed, designation of the key informant and size of the firm. The sample of KIIs covered small, medium and large firms, relevant associations, and non-governmental and non-profit organizations. The duration of each interview was 30 to 50 minutes. A semi-structured questionnaire was prepared for the KIIs, where adjustments were made accordingly during the interview.

Table 2: List of institutions

Type	Institution
Government Authority	Sustainable and Renewable Energy Development Authority (SREDA)
Association	Bangladesh Solar and Renewable Energy Association (BSREA)
	Solar Module Manufacturers Association of Bangladesh (SMMAB)
Renowned TVET	UCEP Bangladesh
Non-bank Financial Institution	Infrastructure Development Company Limited (IDCOL)
Research/ Think tank	Renewable Energy Research Centre, University of Dhaka
	Institute for Clean Energy Training and Research (ICETR), Prokaushali Sangsad Ltd.
	Institute of Fuel Research and Development (IFRD), BCSIR
	Institute of Environment and Power Technology (IEPT), Khulna University
	Center for Sustainable Energy Research (CSER), AIUB
	Green Energy Research Center, Independent University, Bangladesh
	Centre for Energy Research (CER), United International University
	Centre for Energy Studies (CES), BUET

Source: Authors' compilation from various sources

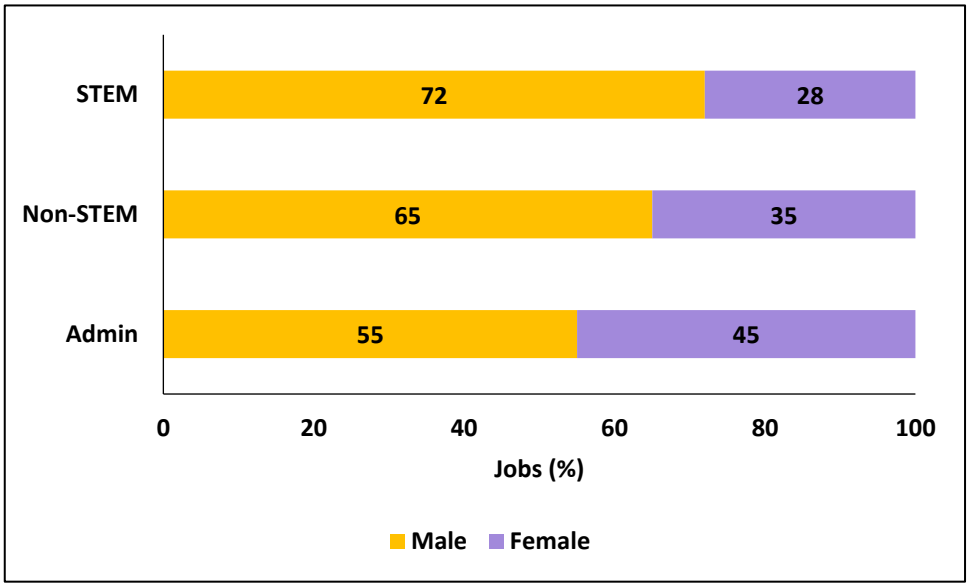
3. Overview of the Sector

3.1 Global Scenario

The usage of renewable energy increased by 1.5% in the first quarter of 2020 compared to a similar period in 2019. Electricity generation from renewable sources grew by 3% during this period over the world due to new wind and solar PV projects, according to the Global Energy Review 2020. Because of cheap operating costs and privileged access to many power networks, renewable energy demand is predicted to grow further (IEA, 2020). According to a recent global report, the worldwide renewable energy market was worth US$613.8 billion in 2020 and is expected to grow to US$1,129.7 billion by 2027, with a compound annual growth rate of 9.1%[2]. Increased demand for renewable energy, rising power consumption, and a boom in legislative and financial measures made by government bodies are all pushing the worldwide renewable energy industry. However, market development is projected to be hampered by issues such as the high initial expenditure required to establish a renewable energy plant[3]. In 2019, contemporary renewables (biomass, geothermal, solar, hydro, wind, and biofuels) accounted for 11.2% of worldwide energy consumption for heating, electricity, and transportation, up from 8.7% a decade before (REN21, 2021). By the end of 2020, renewables accounted for 29% of worldwide power generation[4].

Global employment in renewable energy was estimated to reach 12 million in 2020, up from 11.5 million in 2019 (IRENA, 2021). Figure 1 shows the gender-disaggregation in the employment in the renewable energy sector globally, with breakdown by STEM (Science, Technology, Engineering and Mathematics), non-STEM and administrative positions. Females' share in employment is comparatively higher among administrative professionals than among STEM professionals. On average, women's share in the jobs in renewable energy is 32% globally.

Figure 1: Male-Female Ratio in the Jobs of Renewable Energy Worldwide



Source: IRENA, 2021

[2] Global and Japan Renewable Energy Market Size, Status and Forecast 2021-2027

[3] Allied Market Research (https://www.alliedmarketresearch.com/request-sample/140)

[4] Renewable Energy | Center for Climate and Energy Solutions (c2es.org)

3.2 Bangladesh Scenario

3.2.1. Overview of Policies

The review of relevant policies reveals strong government buy-in in the renewable energy sector. According to the National Industrial Policy 2016, the renewable energy sector is ranked 8th among the 24 “Priority Sectors” in Bangladesh. Renewable energy-consuming industries or factories will be given special benefits under the existing policy for green industrialization and the establishment of environment-friendly industries. Moreover, priority will be given to foreign investment and expatriate Bangladeshi investment in setting up renewable energy-based power plants according to that policy. In line with the Renewable Energy Policy 2008, the Sustainable and Renewable Energy Development Authority (SREDA) has been established under the Companies Act, of 1994 as a focal point of this sector’s development and promotion. SREDA's main objectives include encouraging human resource development and local renewable energy equipment manufacture, facilitating and monitoring renewable energy equipment quality, and assisting in the establishment of a quality control laboratory to test that equipment[5].

The 8th five-year plan (8FYP) contains institutional reforms to promote efficient and renewable energy, resulting in improved access to energy and the creation of new economic possibilities and jobs. Renewable energy reduces poverty through increasing access to energy, which allows for the establishment of new enterprises and job possibilities for the poor, reinforced by financial inclusion. The 8FYP's aim of achieving full cost recovery for all power and energy products is critical to preserving energy and encouraging the growth of renewable energy.

The Perspective Plan 2021 of Bangladesh promised to increase energy efficiency and capacity, renewable energy sources e.g. solar, small-hydro, geothermal, wave, wind and tidal energy, particularly in the coastal belt area. Bangladesh has missed the goal set by Renewable Energy Policy 2008 to reach the share of renewable energy resources in the country’s total electricity demand to 5% and 10% in 2015 and 2020 respectively (USAID, 2021). Power System Master Plan (PSMP) 2016 is developed by the Government of Bangladesh to achieve the target to increase the share of renewable energy in total power generation. According to the five scenarios modelled by PSMP 2016, renewable energy share in the mix of power generation capacity will be 15% by 2041. PSMP 2016 also articulated five value-up plans that include a policy for improving skills and human capital development for a stable energy supply.

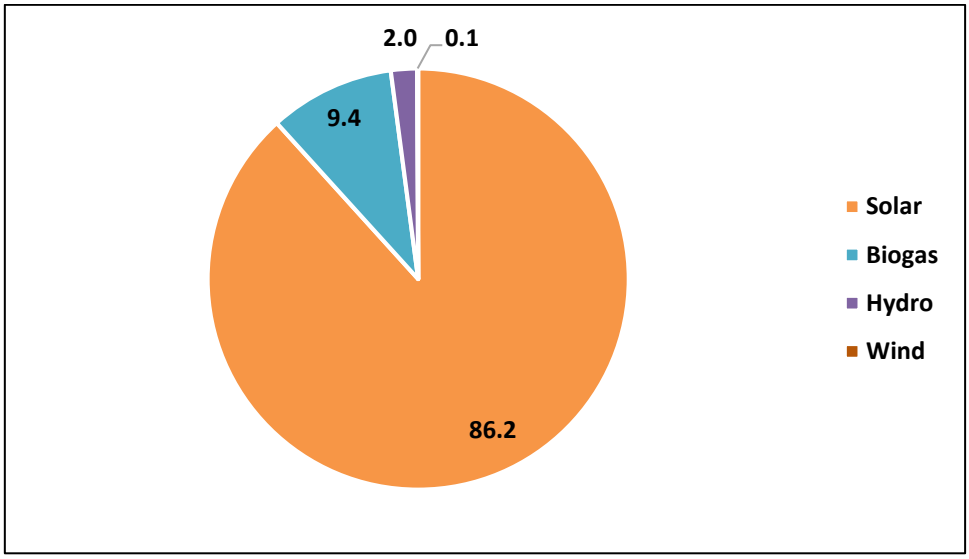
3.2.2. Employment

Bangladesh is ranked 5th among 161 countries in creating solar photovoltaics employment as solar mini-grid projects are estimated to create 0.8 jobs per kilowatt peak on average (IRENA, 2021). Solar jobs are concentrated in 5.8 million installations of off-grid solar home systems, the largest off-grid solar power program in the world giving 20 million Bangladeshis access to electricity (WB, 2021). The solar industry's focus is transitioning from decentralized solar home systems to grid-connected solar installations, which has ramifications for the types and locations of jobs created. The Sustainable and Renewable Energy Development Authority (SREDA) wants to develop a qualified workforce for rooftop solar with at least a bachelor's degree in engineering or five years of experience in the solar industry[6].

[5] https://policy.thinkbluedata.com/sites/default/files/REP_English.pdf

[6] https://www.pv-magazine.com

Figure 2: Renewable Energy Employment by Technology in Bangladesh (%)

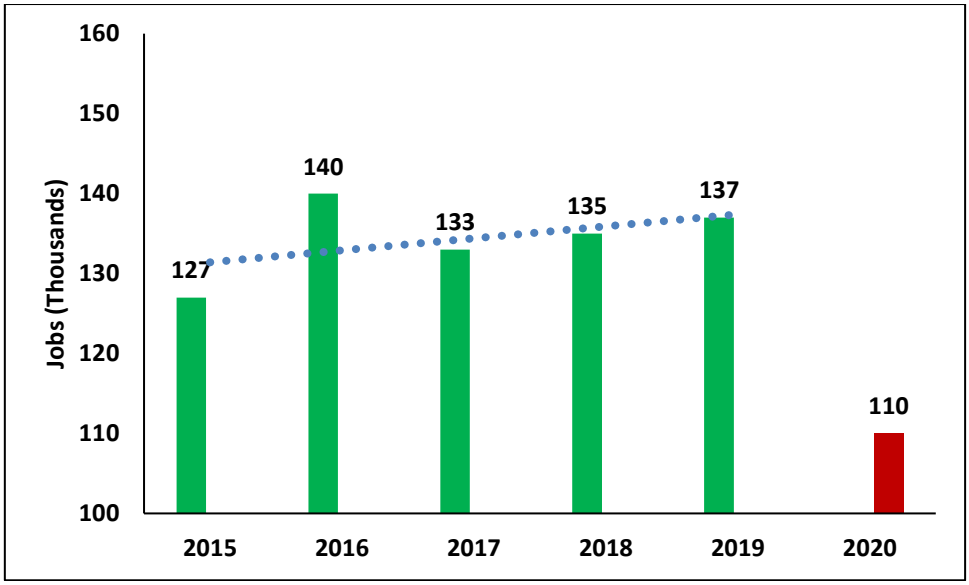


Source: IRENA Jobs database, 2020

From a gendered perspective, renewable energy deployment can promote women's employment as well, since women in rural Bangladesh may work as solar panel installers and technicians (ILO, 2011).

Among the estimated 12 million renewable energy jobs in the world, around 1.27 lakhs are in Bangladesh. The highest share of employment is in the solar photovoltaic industry containing 1.1 lakh jobs (86.2% of total renewable energy jobs) in Bangladesh (Figure 2). The trend of solar photovoltaic employment is shown in Figure 3.

Figure 3: Solar Photovoltaic Employment in Bangladesh



Source: IRENA Jobs database, 2020

Employment in the solar photovoltaic industry in Bangladesh was showing an upward trend from 2015 up to 2019. The upward trend is disrupted during COVID-19 when solar photovoltaic employment came down to 1.1 lakhs in 2020 from 1.37 lakhs in 2019. This can be important evidence to show the impact of COVID-19 in the renewable energy sector of Bangladesh, which is dominated by solar energy.

3.2.3. Sector Potential

Bangladesh currently has renewable energy installed capacity of around 788.76 MW, only around 3% of total energy is produced from renewable sources (SREDA, 2022). This must be raised during the 8FYP, according to the GoB (GED, 2020). Table 3 presents the aspired number of projects as envisioned in the 8FYP.

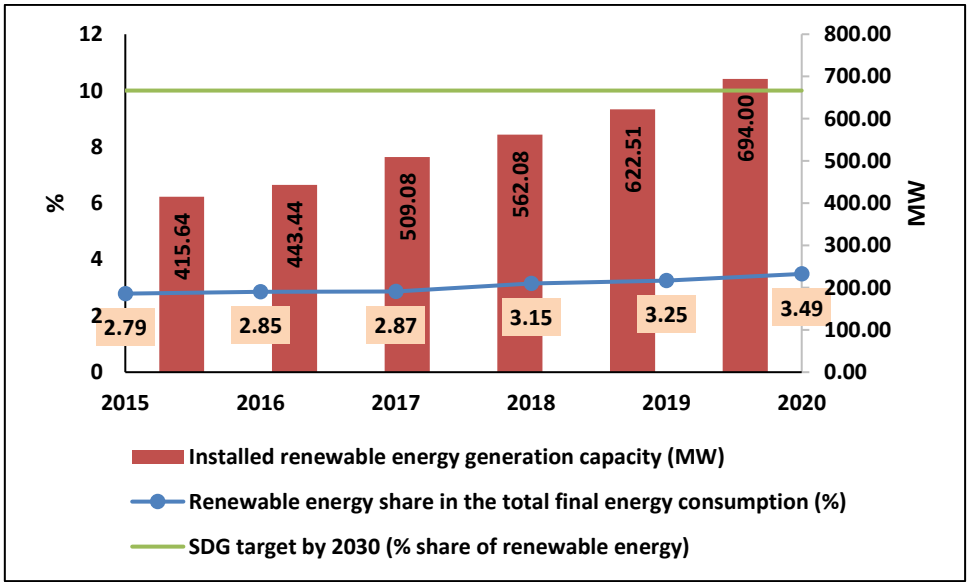
Table 3: Target of Grid-based Major Renewable Energy by Type

Number of Projects	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	Total
Solar	127	542	895	400	50	2014
Wind	0	60	230	0	10	300
Waste Energy (Biomass, biogas etc.)	0	6	42	0	0	48
Total	**127**	**608**	**1167**	**400**	**60**	**2362**

Source: 8FYP, 2021

In 2020, the share of renewable energy in total energy consumption in Bangladesh was 3.49%, which increased from 2.79% in 2015. The installed capacity of renewable energy generation also increased from 415 MW in 2015 to 694 MW in 2020. Bangladesh needs to achieve the SDG target of a 10% share of renewable in total energy by 2030 (Figure 4).

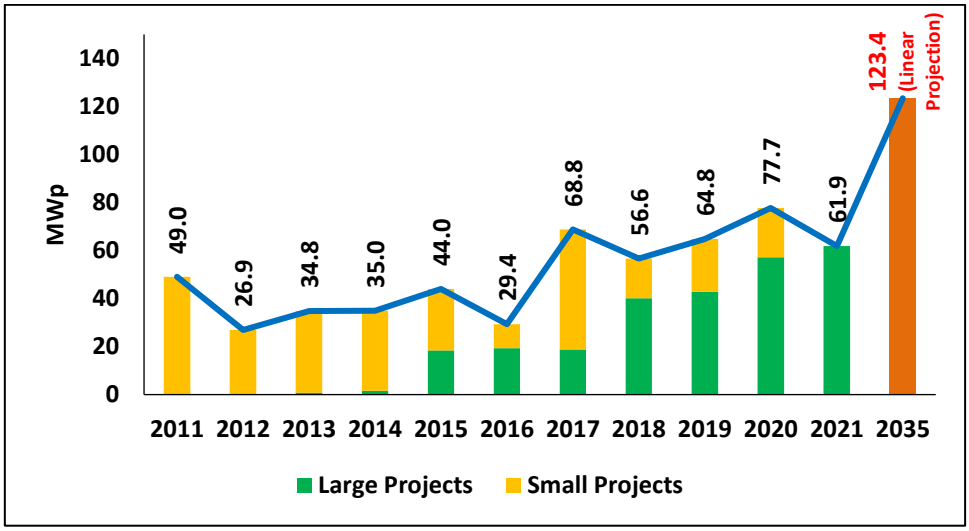
Figure 4: Renewable Energy Generation Installed Capacity and Consumption Trend in Bangladesh



Source: SDG Tracker, SREDA

Bangladesh exceeded 25,000 MW of electricity generation capacity in 2021 which is only half of the projected demand of 50,000 MW by 2041 (ITA, 2021). PSMP 2016 eyes an ambitious target of having 40,000 MW electricity generation capacity by 2030 and 60,000 by 2041. Among this 60,000 MW, Bangladesh targets to achieve 3,864 MW of renewable energy generation by 2041, although it could not meet the target of 2,470 MW by 2021 (PSMP, 2016). The maximum renewable energy generation potential is 3,666 MW which is very low compared to the total grid energy potential due to land availability constraints. However, according to recent studies, the quantity of land suitable for renewables is likely to be more than previously thought (Nicholas & Ahmed, 2020).

Figure 5: Year-wise Power Generation from Renewable Energy Projects (2011-2021)



Source: SREDA, 2021

Figure 5 shows that in the last decade, power generation from large renewable energy projects is consistently rising, confirming the positive expectation of the sector. However, the small firms are not showing a similar kind of consistency, providing some food for thought.

Bangladesh is also experiencing a decline in the cost of renewable energy. It will, however, decline even further, ensuring an effective solution to limit the cost of power generation considering all costs, including the cost of new infrastructure, project costs, fuel prices, and exchange rate. Although the investment cost for renewable energy is higher than that of conventional energy sources, it is expected to fall due to technological advancements.

3.3 Sub-sectors

Natural gas is the major source of grid-based power generation in Bangladesh, the share of natural gas in the present power generation capacity is 52% (10,995 MW). The share of renewable energy is the lowest, 1% in hydro and solar each (230 MW and 229 MW respectively) (Table 4).

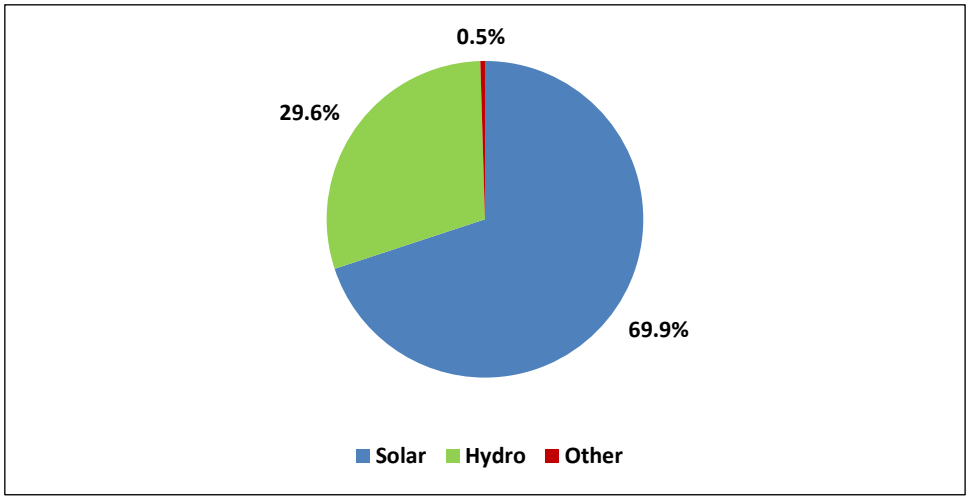
Table 4: Grid-based Power Generation Capacity by Fuel

Source	Number of Power Plants	Installed Capacity (MW)	Percentage	Present Capacity (MW)	Percentage
Natural Gas	65	11,330	51%	10,995	52%
Furnace Oil	61	6,059	28%	5,447	26%
Diesel	10	1,290	6%	1,286	6%
Coal	3	1,768	8%	1,688	8%
Hydro	**1**	**230**	**1%**	**230**	**1%**
On-grid Solar	**8**	**229**	**1%**	**229**	**1%**
Import	-	1,160	5%	1,160	6%
Total	**148**	**22,066**	**-**	**21,035**	**-**

Source: BPDB, January 2022

Among the categories of renewable energy, solar and hydropower dominate the sector in Bangladesh (Figure 6). As discussed before, in the backdrop of consistent positive performance by the sector, the smaller categories are not getting the kind of support required to flourish, which has been further confirmed by the sector insiders during the qualitative survey.

Figure 6: Share of Renewable Energy by Technology in Bangladesh



Source: SREDA

Among the renewable energy power plants signed between January 2009 and December 2021, 8 projects with a capacity of 229 MW have started generating power and 12 more projects with a capacity of 462 MW are under construction, according to BPDB. Table 5 shows the renewable energy capacity of Bangladesh according to the types of technology of renewable energy as of June 2022.

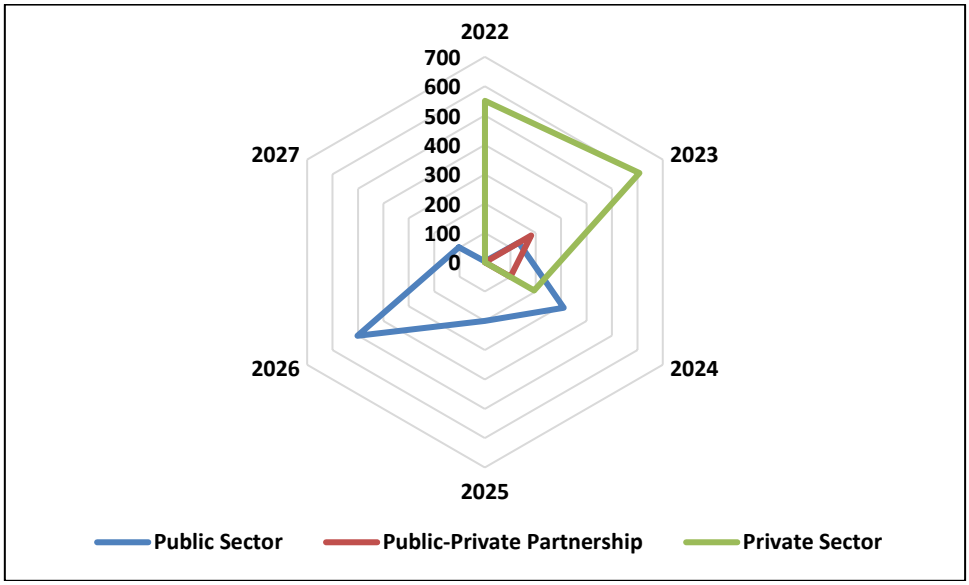
Table 5: Renewable Energy Capacity of Bangladesh (MW)

Type	Off-grid	On-grid	National
Solar	349.96	204.81	554.77
Wind	2	0.9	2.9
Hydro	0	230	230
Biogas	0.69	0	0.69
Biomass	0.4	0	0.4
Total	**353.05**	**435.71**	**788.76**

Source: SREDA, June 2022

According to the ongoing power generation plan, the additional power generation capacity of renewable energy in each year from 2022 up to 2027 has been planned by BPDB, as of January 2022. Figure 7 shows the year-wise plan for the next five years for additional power generation from renewable sources. According to this plan, the total additional unit of renewable energy generation capacity will increase in 2023, then it will decrease up to 2027. The public sector is planned to contribute a steady increase in the additional unit, while the additional unit will fall to 0 MW from 550 MW by 2027 in the private sector. Thus, GoB is planning to strengthen the public sector's capacity in renewable energy generation. Public-private partnership is also expected to experience an increase in additional capacity in the year 2023 and 2024.

Figure 7: Next Five-Year Plan for Additional Power Generation from Renewable Sources



Source: BPDB, 2022

The rest of the section further delves into the various categories or subsectors of renewable energy.

3.3.1 Solar

Solar energy is currently the most promising of the various renewable energy sources in Bangladesh. Starting in 1996, Solar Home System (SHS) is the largest renewable energy program in Bangladesh. About 6 million solar home systems have been installed so far and the number is increasing due to the integrated program adopted by the government through the non-bank financial institution, IDCOL. Encouraged by the success of solar home systems, the government has started several programs such as solar irrigation, solar mini/microgrid, solar park, solar rooftop, solar boating etc.

3.3.2 Hydro

Bangladesh has a long history of renewable energy development, beginning in 1956 with the construction of the country's first hydropower plant on the Karnafuli River near Kaptai in Chittagong. In October 1986, the fourth and fifth units with 50 MW Kaplan-type turbines were added at the centre, bringing total power output to 230 MW on-grid. Kaptai hydropower plant is the only domestic source of hydropower in Bangladesh.

3.3.3 Wind

Bangladesh's first wind power plant was built on 6 acres of land near Lamchi Mouza, Khojaj, on the banks of the Mahuri River and Sonagazi Char of Feni in 2005. Currently, the 12 large wind projects have a capacity of 360 MWp in Bangladesh.

3.3.4 Biogas and Biomass

Biogas is a mixed form of the various gases that are obtained as a result of the decomposition of organic matter. Biogas and biomass have limited use in Bangladesh till now. A total of 76,771 biogas plants have been constructed across the country till June 2020 at the initiative of the Bangladesh Council of Science and Industry Research (BCSIR), GIZ, Ministry of Disaster Management and Relief, Local Government Engineering Department. A biomass

resource mapping survey was conducted by the UNDP-funded project SREPGen. Currently, biomass to electricity has 0.4MWp capacity only.

3.3.5 Geothermal Energy

Anglo MGH Energy, a Dhaka-based private firm, announced in 2011 the development of a 200 MW geothermal plant in Thakurgaon district, the first of its type (Hassanuzzaman et al., 2014). However, for unclear reasons, this project was never launched, and no more developments in this subject have been revealed since then (Das, 2017).

3.4 Import

Bangladesh imports 6% of the present power generation capacity which is 1,160 MW (BPDB, 2022). Due to a lack of suitable land, the implementation of renewable energies on a wide scale in Bangladesh is restricted. For this reason, importing power from neighbouring nations utilizing hydroelectric power generation has a lot more potential than domestic implementations. Bangladesh is at the final stage of confirming a deal with Nepal to import 9,000 MW of hydropower by 2040 from that Himalayan state[7]. To accommodate anticipated future demand, Bangladesh needs more advanced research facilities as well as trained labour to explore renewable energy possibilities both inland and offshore (Uddin, et al., 2019).

[7] https://www.thedailystar.net/city/news/deal-importing-hydropower-nepal-final-stage-2065873

4. Findings from Qualitative Survey

The finding of the in-depth analysis can be categorized into three distinct parts. The first part of the interview provides information about the broad occupational structure of the organization, major tasks and required skills of the employees, and the minimum level of educational qualification and experience. The second part of the interview provides valuable insights on the mismatch between the actual and desired level of skills across occupations, hard-to-fill occupations or skill shortages, and employer's perception of employees' skill levels that help to analyze the skill gap. The third part of the interview provides sectoral concerns and challenges that are faced by the employers.

4.1 Structure of Occupations

Broadly, the research team found two distinct occupation structures, one for small or medium firms and another for large firms (Table 6).

Table 6: Occupational Composition (Small and Medium Firms)

Occupation	Major tasks and required skills	Educational requirement
Engineer	• Business case development • Architecting and structuring • Design development, approval and plan submission • Cost estimation • Equipment and machinery sourcing • Innovative mindset	BSc Engineer
Manager	• Field operation management • Strategic business planning • Program guide and regulation design and disbursement • Performance evaluation • Project design, development and implementation • Field-office communication	Bachelor degree
Field Operators & Technicians	• Field office management • Administration and security of field office • Reporting and logistic support • Product installation • After sale service • Construction monitoring • Designing training activities • Task management and supervision • Field collection of money • Test and trial operation • Tech-savviness	Diploma degree/ Vocational training
Sales Person	• Selling product • Building up customer relation • Motivational skill	Grade 8
Service Staff	• Day-to-day field activity • Solving customer problem • Assisting system installation • Assisting after sale service • Construction, wiring and connection • Regular field visits and monitoring • Tech-savviness	Primary Education

Source: Authors' Compilation from KIIs

The large firms run department-based operations which is somewhat different from the small and medium firms (Table 7). The research team identified three common departments in the

large firms with a similar or advanced level of occupation composition compared to small and medium firms.

Table 7: Occupational Composition in Production (Large Firms)

Department	Occupation	Tasks and Skills	Education level
Customer Interaction	Design Engineer	• Facing customers • Customer enquiry and record data • Design and development • Cost estimation • Design validation • Equipment and machinery sourcing • Offer submission	BSc Engineer
Implementation	Lead Engineer	• Project mobilization • Hiring contractors • Managing technicians	Diploma Engineer
	Technician	• System installation • Running trial operation	Vocational Education
Operation and Maintenance	Operator	• Guiding technicians • Machine operation • Maintenance	Diploma Engineer
	Technician	• Operation and maintenance	Vocational Education
	Sales & Service worker	• Selling of product • Service providers	Technical Knowledge

Source: Authors' Compilation from KIIs

The structure of the organogram is a little different in NGOs and NPOs. In general, they work team wise as described in Table 8.

Table 8: Occupational Composition in Production (NGO/NPO)

Team	Occupation	Major Task	Education level
Management Team	Coordinator	Decision support	Graduate
	Deputy Coordinators		
Technical Team	Engineer	Technical Support	Diploma Engineer
	Supervisor		Vocational Training
	Technician		Vocational Training
Promotion Team	Executive	Promotion, Sales and Marketing, Investment and Collection	-
Support Team	Helper	Operating and maintenance	-

Source: Authors' Compilation from KIIs

Other occupations (except in production) include Admin, Human Resource Executive and Accounts Executives just like other sectors' organizations. Office staffs and storekeepers are common in the lower part of the organogram of all companies.

4.2 Occupations with High Demand

The renewable energy jobs with high demand are listed in Table 9. This list is compiled based on the findings from KIIs and desk research. The solar sector is the most dominating sector in Bangladesh, therefore its jobs have high demand. Based on the skill level, jobs that require minimal training are in high demand. Skilled engineers are scarce in Bangladesh as an occupation, hence we have a high demand for skilled engineers. Skilled technicians' demand

is also moderate but it is comparatively easier to find skilled technicians than to find skilled engineers, therefore it is in medium demand category.

Table 9: List of Jobs with High Demand

Distribution	Demand Category	Jobs
Sector-wise	High Demand	Solar Jobs
	Medium Demand	Biogas and Hydropower Jobs
	Low Demand	Wind Jobs and others
Skill-wise	High Demand	Jobs that require minimal training
	Medium Demand	STEM Professionals
	Low Demand	Non-STEM and Administrative Professionals
Occupation-wise	High Demand	Skilled Engineers
	Medium Demand	Skilled Technicians
	Low Demand	Management, Sales, Service

Source: Authors' Compilation from KIIs and Desk Research

4.3 Significant Vertical and Horizontal Skill Mismatch

There is a significant gap in skills and education, which are required for the industry. At the manager level, the employers require students from the science background, but they are also being allowed from the non-science background. For the field operators, they should have a diploma and other academic degrees as well. However, for feasibility and cost minimization, the off-grid solar panel companies hire technicians from the local community, compromising degree requirements, which is a challenge and also presents a potential opportunity. Also, sometimes employers compromise with educational qualifications if the workers have additional skills, which is a common scenario of industry sub-sectors in general.

4.4 Hard to Fill Occupations

Design jobs are predominantly highly skilled and permanent., By contrast, fewer jobs are permanent and most are semi-skilled in construction and operations (IRENA, 2021). The suppliers of renewable energy need more experts, skilled engineers and technicians, according to industry insiders. Presently, diploma engineers are fulfilling the demand of these categories. However, to realize the potential of the sector, the industry has the necessity of more sophisticated skills, including problem-solving, repairing and others, apart from the assembling of the available pieces of machinery. These skills require engineers with more expertise, whereas the diploma engineers are falling short. However, due to the lack of sector-relevant departments in the tertiary education system, the necessary "skilled human resource" is not being produced. As a result, as mentioned by the sector insiders, regardless of the size of the firms, all the stakeholders face a scarcity of skilled engineers. On the other hand, technicians can be found easily compared to engineers, conditional on having a strong linkage with TVET institutions.

4.5 Shortage of Soft Skills

From manager to technician, alongside education, employers look for some soft skills. Skills of planning and implementation, managerial skills, communication skills, and tech-savviness are some of the most important soft skills required in this sector. Employers experience a gap in these essential soft skills. In the department of account, for instance, there is a lack of skilled people, and it becomes cumbersome to manage the account-related work with unskilled workers. Moreover, due to the lack of soft skills and the challenges to adopt digitalization, account managers have to face challenges.

4.6 Extent of Informality in the Sector

A high rate of job turnover due to the absence of job security, training programs, job benefits and so forth is present in this sector. In particular, due to a lack of opportunity in terms of career growth, job security and low wage, the skilled workforce are unwilling to engage in this sector. The stigmatization resulting from the informal nature of employment, and subsequent family pressure is demotivating young graduates from tertiary educational institutes to join small sectors with high technical skill requirements. Furthermore, despite apparent willingness from the employers' side to retain the skilled labour force, skill level has to be compromised to accommodate the salary structure.

4.7 Poor Industry-Academia Linkage

The strong linkage that is found between industry and TVET is absent between the industry and the general line of academia. Renewable energy-related knowledge and education are absent in the academic curriculum at the secondary or tertiary level. Though it is a small sector, the building up of professional training of skills, that are particularly required for this sector, should be started during the under-graduation period to make the sector flourish as a whole. There is no specific department for renewable energy engineering in the universities of Bangladesh, which is crucial for realizing the potential of the sector, according to sector insiders.

4.8 Present Recruitment and Up-skilling Process

Skilled employees comparatively get higher salaries according to all the firms. However, due to the absence of a confirmed signal of expertise, as discussed before, employers are less willing to hire "Skilled labour force" paying a higher salary. Employers prefer hiring unskilled workers and providing them with short training. Hence, the lack of professional training programs leads the recruiters to have low expectations from their workforce. Due to the low expectation of firms from their employees, firms are recruiting fresh engineers and other workers and providing hands-on training to the freshly recruited employees during the first couple of months. A few of the workers are also provided with certified training programs by the firm. Hands-on trainings are more common than the certified trainings in this subsector. However, trainings are also arranged regularly by some of the firms for up-skilling. It works as a coping strategy for the skill mismatch that is responsible to increase production costs due to the cost of training. Therefore, due to skill mismatch, the cost of production is increasing and the overall firm's efficiency is hampered.

4.9 On-job Training and Their Effectiveness

The existing firms are able to ensure effective training programs for the workers, according to the stakeholders. All the key informants acknowledged that on-job trainings are effective compared to the absence of it. These trainings are provided frequently and on regular basis. There are mainly two types of training categories, field-based and in-house training as needed by the firm. Based on the modality of the trainings, there are both certified training and hands-on training. Hands-on trainings are more common for small companies in the renewable energy sector. Hands-on trainings sufficiently serve the specific purpose of the company but these trainings can barely serve the industry as a whole due to not having proper documentation of training among workers. Therefore, the smooth transition of the labour force and industries without being underemployed is not a recurrent scenario, pointing towards inefficiency for the small firms.

If the world can enhance its pace and scale through a holistic strategy, the ongoing energy transition has the potential to be one of history's great success stories. Comprehensive policy frameworks based on effective social discourse, on the other hand, must employ labour market incentives to provide new opportunities for workers who lose jobs in conventional

energy (IRENA, 2021). According to the ILO report, the transformation will have the biggest impact on male-dominated, medium-skill jobs. About 15.8 million medium-skill jobs will be gained while 3.1 million will be lost by 2030. High-skill jobs will face similar losses and 4.5 million gains. On the other hand, 4.8 million low-skill jobs will be gained and 1 million will be lost in the same period in the renewable energy sector (IRENA, 2021). This is further assured by the qualitative responses in this study for Bangladesh.

However, skill matrix is followed by large companies to address the problems related to the skills mismatch to some extent. In this matrix, firstly, the required skills have been identified and then yearly training programs are arranged to ensure those skills. To address the skill gap, several training programs are provided, such as to build awareness, increase output, develop the awareness to reserve the products, foundation training and so forth. Technical persons in the production unit are trained with products and sourcing, handling, installation, fabrication, troubleshooting, maintenance, preserving, hardware and software skills, testing, assembling, grid setup, servicing, automobile, electronic and electrical etc.

4.10 TVET as a Potential Solution to Produce Skilled Labour Force

At present, civil, electrical and mechanical engineers are required for this sector and TVET is playing a vital role to provide these diploma engineers as well as skilled technicians. Arguably, the technical education system can play a more involved role to produce a skilled labour force. However, except for a handful of TVET institutions, other TVET institutions are not able to reach this threshold of minimum quality. During the in-depth interviews, a repetition of names of a few TVET institutions was found, which is not enough for scaling up the sector. While large firms majorly depend on reputed TVET institutions, small firms still depend on hands-on training with a lower level of education among the workers. More TVET industries should be developed, and the standard needs to be strictly maintained to produce the required number of the skilled labour force, according to the key informants.

4.11 Lack of R&D Related Skills and Funding

There is a lack of both skills and funding in the research and development department of this sector. For the next ten years, a more efficient workforce is needed to conduct adequate research for the development of the sector. Adequate laboratory, infrastructure, and investment are required to scale up from assembly-line to innovative solutions. The relevant SDG indicator shows that around US$497 million flows to Bangladesh in support of clean energy research and development and renewable energy production, which is far below the target of US$ 800 million by 2030 (ERD, FY 2018-19).

4.12 Impact of Fourth Industrial Revolution

There is immense potential in the renewable energy sector as it is environmentally friendly. A significant number of people are starting entrepreneurship and the government is also giving priority to this sector. In the next 10 years, the energy sector will boost up and will need many more engineers and researchers, according to the relevant stakeholders. Moreover, as the fourth industrial revolution is knocking at the door so there will be more demand for technological experts. Bangladesh is also going for semi-automation. For addressing the challenges that emerged due to the fourth industrial revolution, the demand for technicians and engineers will be increased during the next several years. However, it is quite difficult for Bangladesh to address the challenges that emerged due to the fourth industrial revolution as the country does not have sufficient technological support. Bangladesh is largely dependent on China which decreases the investment or the willingness to invest in this sector. Government should undertake more initiatives to increase the amount of skilled labour who can use mobile apps in the process of digitalization, according to the recruiters.

4.13 Impact of the COVID-19 Pandemic

Due to the pandemic, this sector experienced negative growth and the area of this sector has reduced, according to the key informants. Though several new sectors have emerged, such as solar irrigation pumps, the primary cost is high comparatively high. The sector lacked adequate financial and other relevant support during the pandemic. For instance, the private sector should be encouraged by the government to provide renewable energy. Due to the lack of support, the sector is still being operated mostly at the government level along with some small companies that started based on tests and trials.

4.14 Relevant Policy Support

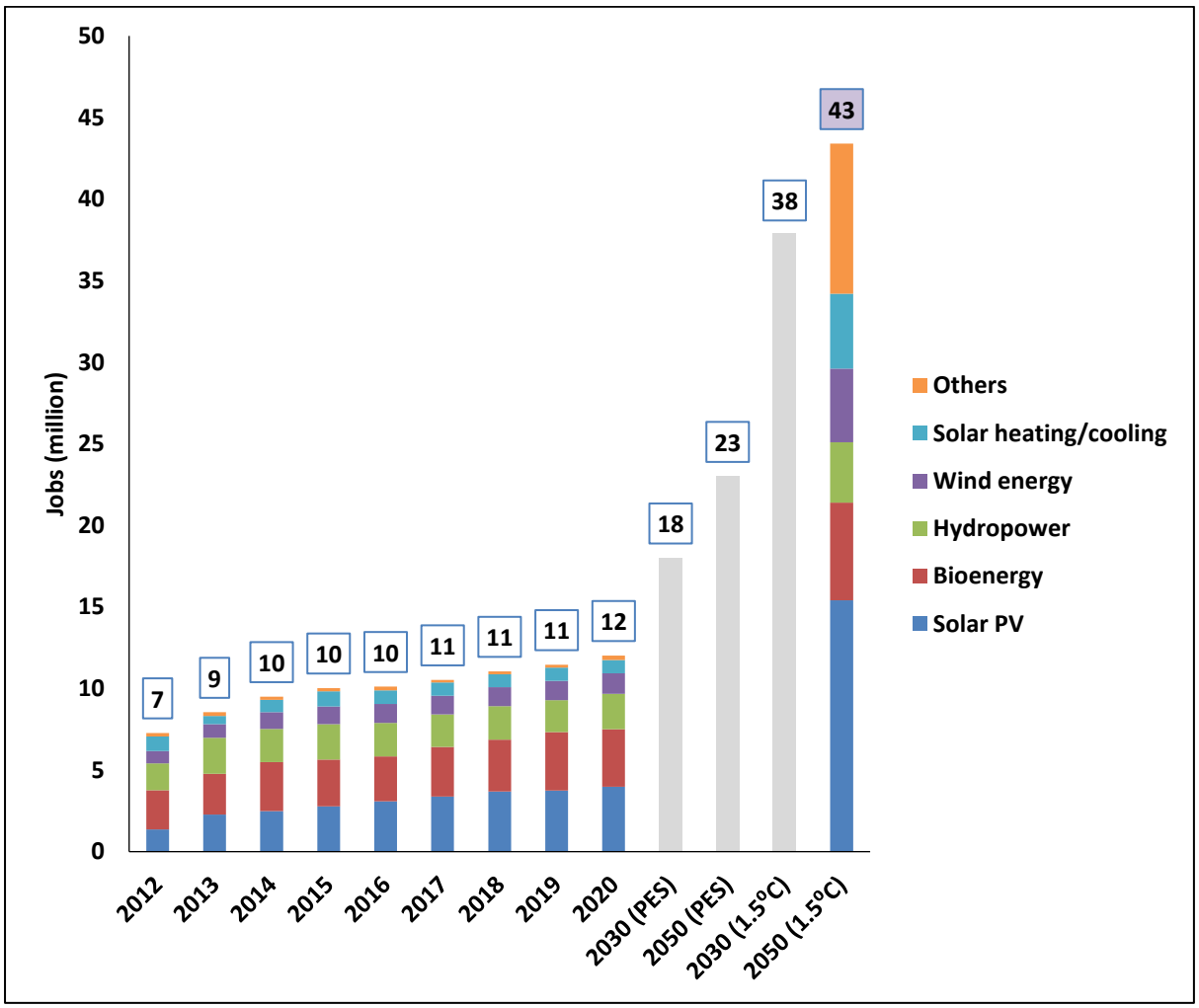
Despite being on the priority list of GoB, the demand for renewable energy has not increased due to the lack of quality service. After sales service quality is very low which reduces user satisfaction and the market is hampered overall due to this reason. Therefore, the demand for labour has also suffered in this sector. The relevant stakeholders suggested Government take initiative to generate demand for this sector, promote renewable energy and build awareness, along with providing necessary investment. The promotion of renewable energy generation is addressed in Renewable Energy Policy 2008, Power System Master Plan 2016, 8th Five Year Plan, and Perspective Plan 2021. However, there is a lack of supportive policy to increase the demand and create awareness among the consumers. Proper implementation of policies also needs to be addressed.

5. Employment Projection

In 2020, the renewable energy sector, directly and indirectly, employed 12 million people, as estimated by IRENA. Over the last decade, the number has increased globally. The major employments have been in the solar photovoltaic (PV), bioenergy, hydropower, and wind power sectors. Figure 8 depicts the trend of IRENA's estimates of renewable energy employment from 2012.

Figure 8 also shows that, if the world follows IRENA's 1.5°C scenario[8], renewable energy employment may reach 38 million by 2030 and 43 million by 2050. The planned energy scenario (PES)[9] increases job numbers more slowly and to a smaller extent, with 18 million by 2030 and 23 million by 2050.

Figure 8: Global Renewable Energy Employment by Technology (Past, Present, Future)



Source: IRENA, 2021

[8] The 1.5°C Scenario (1.5-S) offers an energy transition scenario that is linked with the 1.5°C climate ambition — that is, to limit global average temperature rise to 1.5°C by the end of the current century, relative to pre-industrial levels. It prioritizes easily accessible technological solutions that can be ramped up at the necessary rate to meet the 1.5°C target.

[9] Planned Energy Scenario (PES) provides a view on energy system development based on governments' existing energy plans and other planned objectives and policies, including Nationally Determined Contributions (NDCs) under the Paris Agreement.

Based on the country's linear trend of installed renewable energy generation capacity from 2015 to 2020 and the number of jobs in this sector (along with the breakdown by the subsectors) in Bangladesh estimated by IRENA in 2020, this study performs a linear projection of renewable energy employment in Bangladesh up to the year 2035, given that the share of employment in the subsectors (solar, wind, hydro, biogas and others) will remain constant. According to this projection, Bangladesh will have 2.82 lakhs of renewable energy jobs by 2035, the majority (2.43 lakhs) of them are solar energy-related jobs (Table 10).

IRENA analyzed the human resource requirements for the solar PV sector. According to their Annual Report on Jobs (IRENA, 2021), 64% of the workforce requires minimal formal training. Individuals with degrees in science, technology, engineering, and mathematics (STEM) are required in smaller numbers (around 31%). Highly qualified non-STEM workers (such as attorneys, logistics specialists, marketing professionals, or regulatory and standardization experts) account for around 4%, with administrative staff accounting for the least percentage (1%). Based on this share and our projection of solar jobs in Table 8, the current study projects (linear) these jobs in the solar photovoltaic industry up to the year 2035 in Bangladesh. At present, there are 1.1 lakh jobs in the solar photovoltaic industry in Bangladesh which is projected to reach 2.42 lakhs by 2035 (Table 11).

Table 10: Linear Projection of Renewable Energy Installed Capacity and Employment in Bangladesh (2021-2035)

Year	Installed capacity (MW)	Total Employment (thousands)	Solar Jobs	Biogas Jobs	Hydro Jobs	Wind Jobs	Other Jobs
2020	694.00**	127.60*	110.00*	12.00*	2.50*	0.10*	3.00*
2021	739.32	135.93	117.18	12.78	2.66	0.11	3.20
2022	795.95	146.35	126.16	13.76	2.87	0.11	3.44
2023	852.58	156.76	135.14	14.74	3.07	0.12	3.69
2024	909.21	167.17	144.11	15.72	3.28	0.13	3.93
2025	965.84	177.58	153.09	16.70	3.48	0.14	4.18
2026	1022.47	187.99	162.06	17.68	3.68	0.15	4.42
2027	1079.10	198.40	171.04	18.66	3.89	0.16	4.66
2028	1135.72	208.82	180.01	19.64	4.09	0.16	4.91
2029	1192.35	219.23	188.99	20.62	4.30	0.17	5.15
2030	1248.98	229.64	197.97	21.60	4.50	0.18	5.40
2031	1305.61	240.05	206.94	22.58	4.70	0.19	5.64
2032	1362.24	250.46	215.92	23.55	4.91	0.20	5.89
2033	1418.87	260.87	224.89	24.53	5.11	0.20	6.13
2034	1475.50	271.29	233.87	25.51	5.32	0.21	6.38
2035	1532.12	281.70	242.84	26.49	5.52	0.22	6.62

(Jobs in thousands)

Source: Authors' calculations based on various sources
** IRENA Jobs database, 2020*
*** SREDA, 2020*

Table 11: Projection of Solar Photovoltaic Jobs by Skill in Bangladesh (2021-2035)

Year	Solar jobs*	Minimal training	STEM professionals	Non-STEM professional	Administrative
2020	110.00	70.4	34.1	4.4	1.1
2021	117.18	75.0	36.3	4.7	1.2
2022	126.16	80.7	39.1	5.0	1.3
2023	135.14	86.5	41.9	5.4	1.4
2024	144.11	92.2	44.7	5.8	1.4
2025	153.09	98.0	47.5	6.1	1.5
2026	162.06	103.7	50.2	6.5	1.6
2027	171.04	109.5	53.0	6.8	1.7
2028	180.01	115.2	55.8	7.2	1.8
2029	188.99	121.0	58.6	7.6	1.9
2030	197.97	126.7	61.4	7.9	2.0
2031	206.94	132.4	64.2	8.3	2.1
2032	215.92	138.2	66.9	8.6	2.2
2033	224.89	143.9	69.7	9.0	2.2
2034	233.87	149.7	72.5	9.4	2.3
2035	242.84	155.4	75.3	9.7	2.4

(Jobs in thousands)

Source: Authors' calculation from IRENA Renewable Energy and Jobs - Annual Review 2021
** Column extracted from Table 10*

6. Policy Implications

Based on the findings from desk research and in-depth qualitative interviews, the research team has formulated some policy recommendations for mitigating the skill gap and designing skill development programs for the renewable energy sector as well as the overall progress of the sector.

The unavailability of employment data for this sector is hindering the development of necessary action plans for the skill development of the sector. Being a small sector, nationally representative labour force survey and enterprise survey cannot provide the actual figures of employment in this sector, let alone the skill level of the workforce. The government may emphasize the collection of quality data regarding the employment scenario of the sector.

If the skill gap and skill mismatch concerns are to be addressed, public and private investment in research and development of this sector are crucial. The continuing influx of engineering graduates and specialists has the potential to make larger contributions to both research and output. However, without government promotion and private sector facilitation of significant research on further modernization of manufacturing and cutting-edge inventions, these challenges, as well as the industry's overall competitiveness, would be jeopardized. To recruit a larger and more varied range of candidates for the future workforce, business, government, and educational and training institutions must work closely together to balance skills need and supply.

At present, TVET is playing a vital part to supply required technicians for the sector. The quality of all the TVET institutions should be increased to meet the benchmark. Small TVET institutions can take a lesson from large institutions to follow best practices that lead to a successful TVET-Industry linkage. Necessary steps should be taken to strengthen the industry-academia linkage to mitigate the skill gap in the industry. Renewable energy-specific curriculums should be developed for the tertiary institutions that can help to train the graduates who need to enter the market. Tertiary education should emphasize creating engineers with sophisticated skills instead of focusing on creating engineers who are motivated to become administrators only. Professional trainings should be institutionalized, not only hands-on. The government needs to ensure public-private partnership and green technician development programs through international affiliation. International or foreign experts may conduct these training programs.

Renewable energy-related knowledge and education should be included in the academic curriculum. Specific departments specialising in renewable energies are crucial for realizing the sector's potential. Hands-on training can barely serve the industry as a whole due to not having proper documentation of training among workers, therefore, certified training should be preferred more. It can ensure a smooth transition of the labour force and industries without being underemployed or unemployed.

The firms should prioritize appropriate strategies to minimize the high turnover rate. Strategies are needed to acquire the full potential of the labour taking into consideration the extent of informality prevailing in the sector. The extent of informality should be reduced and labour protection should be ensured for the long-term development of the sector. Through these strategies, permanent labourers will be motivated to build up sophisticated skills that need a long time of practice. Temporary labours' skills should be translated properly to other relevant sectors with backward and forward linkage, skill waste might be reduced in that way. As skills linked with losing occupations do not always align with those required by emerging jobs, a proper strategy is needed to address the skill transition.

Government should now focus on on-grid renewable energy besides off-grid to meet the energy demand and to better compete with the non-renewable sources of energy. The proper

translation of skills is needed to make the transition from off-grid to on-grid smoother. Being a capital-intensive industry, the sector is still not sustainable as a business in a labour-intensive country like Bangladesh. Ease of doing business should be enhanced particularly for this sector and government support is needed for capital flow and accumulation. Solar is still the most dominant sub-sector in the renewable energy sector while the country is still lagging in the smaller subsectors like wind and biomass, which often remain unnoticed. The success in the solar industry is overpowering the success of the overall industry but we need to address the frustrations in comparatively smaller subsectors.

The pandemic hit this sector extensively. Many firms limited their operations and scaled down their production. Specifically, the wind and biomass sectors are in a vulnerable position, according to sector experts. Governmental support and stimulus packages are required for this sector to address the hiccups caused by COVID-19. The Government may need to provide tax holidays or other support for the protection of the domestic market. Coordination between the livestock department, environment department and soil plant department need to be developed for the growth of the renewable energy (biogas) sector. More initiatives and strong research are needed to utilize the potential of the wind sector. Overall, the sector needs support for increasing investment and monitoring and regulatory system development.

Government needs to develop a business-friendly infrastructure and ensure more investment in research and innovation. The investment in research and innovation will eventually increase the prosperity of this sector. Finally, adequate implementation of the relevant policies such as Renewable Energy Policy, and Industrial Policy should be prioritized. The lack of coordination among the government stakeholders should be minimized for the betterment of the sector in all aspects. Government support is needed not only the skill development but also to ensure the overall growth of this sector. Although renewable energy is expected to face a higher demand worldwide in near future, the scopes of the sector in the context of Bangladesh will depend on the actions undertaken to realize the potential of this sector. The government should explore all the opportunities and scopes to expand the sector as much as possible.

7. Conclusion

Despite the sector being on the government's priority list, the renewable energy sector is facing a lot of obstacles. The skills of the workers in this sector are at the bottom of the priority list of this sector's stakeholders due to the apparent lack of demand in the sector. However, the skill gap can still be an alarming issue in this sector from the perspective of the emerging fourth industrial revolution and LDC graduation of the country if not addressed timely. In this regard, more in-depth quantitative investigations on certain categories of firm size and type can produce disaggregated data that can subsequently give critical insights.

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Annexe 1

Table 12: Sample of KII

Type of stakeholder	Designation of the respondent	Firm size	Area of work in the sector
Start-up Company	Head of Operations	Medium	Solar Home System, Peer-to-peer solar sharing grids
Private Company	Managing Partner	Small	Solar photovoltaic installations
Private Company	Program Director	Small	Solar Home System, Solar Irrigation, Solar Street Light, Net metering
Non-governmental Organization	Coordinator & Deputy Coordinator	Large	Solar Home System, Solar Irrigation, Solar Street Light, Net metering, Biogas
Non-governmental Organization	Divisional Manager	Large	Solar Roof-top System, Solar Irrigation System, Improved Cook Stove, Wind energy, Biogas
Non-profit Organization	Executive Director	Small	Solar energy, Biogas, Biomass, Improved Cook Stove
Non-profit Organization	Head of Operations	Medium	Improved Cook Stove, Solar Home System and Biogas
Association	Senior Vice President & CEO	Large	Solar Park, Solar Home System, Solar Minigrid, Solar Micro/Nano Grid, Solar Irrigation, Rooftop Solar, Net Metering Program, Solar Drinking Water, Solar Street Light, Solar powered Telecom BTS, Solar Boat, Solar Water Heating