



The Role of the Light Engineering Industry Sector in Achieving Sustainable Development Goals (SDGs) of Bangladesh

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Abstract

This study attempts to investigate the role of the light engineering industries (LEIs) sector in achieving the Sustainable Development Goals (SDGs) of Bangladesh. The study focused on extracting relevant literature to accomplish the study's aims. For finding academic literature sources, this study employs Google Scholar, ResearchGate, numerous academic journals, published books, UN publications, media stories, and the internet. The LE industry, as a thrust sector and "mother of other sectors," has been aggressive in making progress toward achieving the SDGs in Bangladesh. The LEIs sector can make a greater contribution to poverty reduction (SDG 1) and economic growth (SDG 8) by creating substantial employment and also offering on-the-job and formal training as well as basic reading and numeracy which is critical for achieving SDG 4. This sector has also been proactive in reducing gender inequality (SDG 5) and inequalities within the country (SDG 10) by providing work opportunities for women (particularly rural women) in both rural and urban settings in Bangladesh. This sector had a great potential to contribute to economic development (SDG 8) through GDP growth during the previous few decades. Growth in the local industry (SDG 9) has increased domestic demand through subcontracting and public-private partnerships which have a lot of opportunities to use modern technologies. The LEIs have grown in industrial clusters in urban industrial zones and belong to the green industry category (SDG 11) as per the country's environmental regulation. The LEIs only generate recyclable solid waste (SDG 12) and are environment friendly (SDG 13) due to no chemical or fly ash disposal in these factories. Government and financial institutes should take initiative to assess finance for investment with flexible conditions. The Government should establish LEIs cluster villages with all kinds of industrial facilities in different parts of the country and also should adopt a separate national light engineering policy to address current issues.

Keywords: Light Engineering Industry, SDGs, Bangladesh.

1. Introduction

The Sustainable Development Goals (SDGs) are the cornerstone of the 2030 Agenda for Sustainable Development, which was adopted by the international community on September 25, 2015 (UN, 2015). The 2030 Agenda for Sustainable Development is a new development framework that aims to transform our world and will guide all global, regional, and national development efforts for the next 15 years, and it took effect on January 1, 2016 (UN, 2015). The SDGs are a collection of 17 global goals (Annexure 1) with 169 targets set by the United Nations which were approved by all 193 UN Member States, paint an inspiring vision of what the world could look like in 2030. The 2030 Agenda calls for collaborative partnerships on all levels and emphasizes the achievement of sustainable development for all by building on the principle of “leaving no one behind”. The SDGs reflect the moral principles that no one and no country should be left behind, and that everyone and every country should be regarded as having a common responsibility for playing their part in delivering the global vision (Osborn, et al., 2015). These goals, and their associated targets, frame the Agenda 2030 with the vision and ambition to both achieve a balance among the three dimensions of sustainable development- environmental, social, and economic- and integrate them into a universal and visionary framework for global cooperation and action. This integrated approach intrinsically recognizes the interrelated nature of all goals and targets, their trade-offs, and synergies.

The agenda's targets mark a clear departure from previous development programs because they directly hold the international community, including businesses, non-governmental organizations, and research institutions responsible for the implementation of the goals (Gupta & Vegelin, 2016; Wysokińska, 2017; Bojer, 2017). It was also clear that achieving these goals would require the emergence of original partnership structures to build new collaborations among private, public, and research communities (Gusmão et al., 2018; Jayasooria, 2016). Inclusive and sustainable industrialization drives sustained economic growth, and the creation of decent jobs and income (SDG 8); it helps reduce poverty (SDG 1), hunger (SDG 2) and inequalities (SDG 5 and 10), while improving health and well-being (SDG 3), increasing resource and energy efficiency (SDG 6, 7, 11, 12) and reducing

greenhouse gas and other polluting emissions, including from chemicals (SDG 13, 14, 15). There is strong evidence that citizens living in developed industrialized countries enjoy far more prosperous and healthy lives than those who reside in the least developed countries (Upadhyaya & Kepplinger, 2014).

As a thrust sector and ‘the mother of all sectors’, the Light Engineering Industries (LEIs) sector has a very significant role in the socio-economic development of the country. The LEIs sector acts as a feeder to key national industries (Choudhury, 2020). The LEIs sector contributes to the industrial sectors of the country by producing spare parts, small capital machinery, repair services for cement, paper, jute, textile, sugar, food processing, railway, shipping, automobiles, marine tech, agriculture, furniture, garments manufacturing sectors, etc. Consequently, LEIs sector has been creating a silent revolution as an important labour-intensive sector (Begum, 2016). The LEIs sector has a lot of prospects in poverty alleviation through employment generation; increasing contribution to GDP; growth of the local industry; reduction reducing in import of LE products and increasing export opportunity (Majumder & Dey, 2020a). As a potentiality of LEIs sector, the government of Bangladesh declared the “Light Engineering goods” as “Product of Year” for 2020 to aim at encouraging the product-based export by calling for more investment as a part of the export policy (BSS, 2020). In the present era, all progressive countries as a part of their development strategy have been intensifying their efforts to develop LEIs sector which acts as a prime mover for growing a country's industrial base (Kayemuddin, & Kayum, 2013; Uddin, 2010). LEIs sector can be more value-adding and can earn substantial foreign currency next to the ready-made garments (RMG), if provided with proper financial, technical, infrastructural and marketing support. Whichever country wants to grow this sector must be ready to infuse enough capital into the sector. Due to a lack of capital in the sector, Bangladesh's LEIs sector is reeling (Ahmad & Jahan, 2017).

The LEIs have been recognized as a thrust sector in the Export Policy (2015-2018), termed as a high priority sector in the Industrial Policy (2016-2021) and acknowledged as a booster sector in SME policies. Its prioritization has also been mentioned in the 7th Five Year Plan (7th FYP) and 8th FYP due to its employment generation capabilities which can lead to poverty alleviation, thus helping meet targets in

the SDGs. This study focuses on the role of the LEIs sector to make progress toward achieving the SDGs in Bangladesh.

2. Background of Light Engineering Industry Sector in Bangladesh

The LEIs sector, an important sub-sector of the overall manufacturing sector of Bangladesh, is fueling the growth of many other industries in the country (BFTI, 2016; Majumder & Dey, 2020a). It is providing support to agricultural, industrial, and other sectors of the economy by manufacturing a wide range of spare parts, casting, molds and dices, oil & gas pipeline fittings, light machinery, etc., as well as by providing extensive repair services to those. (Talukder & Jahan, 2016; Haque, 2013).

Quadir and Mahamud (2009) stated that, although there is no historical reference to the LE industry in Bangladesh, the common saying is that the industry started by providing maintenance support to the large-scale industrial units commissioned in the 1950s in Bangladesh (then East Pakistan). Before 1970 there were a few industrial establishments in Bangladesh that relied on foreign machines and spare parts. However, some mechanics having experience in the industries started producing some parts (Talukder & Jahan, 2017). After the liberation of Bangladesh, non-Bengali industry owners left the country. After independence in 1971, only 100 LE industries existed (Rahman, 2018). The government took over these factories under large public sector corporations. Bangladesh set up more units of the industry under the corporations. It created a large demand for spare parts which were earlier imported by the private owners (Talukder & Jahan, 2016). After 1980 indigenous light engineering workshops emerged around Dholaikhal, Jinjira, Mirpur, Syedpur, etc. (Talukder & Jahan, 2016). Indigenous light engineering talents of Dholaikhal and Jinjira have long been a lifeline for the manufacturing industries and automobile sector of Bangladesh (Talukder & Jahan, 2017).

In 1984, Dholaikhal caught the attention of the Government. It was felt that although the LEIs had praiseworthy skills they could not make quality parts due to a lack of modern machinery, continuity of demand, and staff with formal technical qualifications (Talukder & Jahan, 2016). Bangladesh Small and Cottage Industries Corporation (BSCIC) provided

targeted low-interest loans to LE enterprises to purchase machinery and as working capital. To address continuity of demand government passed a circular making it mandatory for sector corporations to purchase local spare parts if available. BSCIC enlisted the enterprises with product categories so that the industrial buyers including government sector corporations could get access to the LE producers (Talukder & Jahan, 2016). The LEIs sector got a huge encouragement.

The LEIs are scattered throughout the country in districts, Upazillas and growth centers. The SME Foundation has identified 31 light engineering clusters located in 18 districts of Bangladesh (Foundation, 2013). There are some traditional clusters of LEIs such as the old town of Dhaka city, the industrial zone of Khulna and Gazipur, northern parts (Bogra, Nougá, Pabna) of the country, major land and water transport stations like Narayangong, Chittagong, Jessore (Haque, 2013). Most of the LEIs are micro and small that are financed and managed by the owners of the businesses. International Finance Corporation (IFC) conducted a study on the LEIs sector and estimated that the total annual turnover of the sector is US\$ 1600 million of which import substitute products are around US\$ 200 million (BPC, 2015). A study conducted jointly by International Finance Corporation (IFC) in partnership with UK Department for International Development and the Norwegian government showed that the LEIs sector generates employment for 600,000 people who are working in 50,000 micro firms and 10,000 Small and Medium Firms (Haque, 2013). Choudhury (2020) stated that the LEIs Sector of Bangladesh created about 3,00,000 direct employments and at the same time around 30,00,000 indirect job opportunities in different supportive industries.

The LEIs sector is broadly divided into three components- foundries, machine shops and repair workshops (Uddin, 2009). Rabbani (2005) stressed that the LEIs sector should have a local engineering aspect in the design of a product or its making, i.e., where indigenous engineering intellect or skill has a contribution. The main processes are cutting, blending, machining, shaping, milling, hobbing, rolling, extruding, drawing, sawing etc. (Adhikary & McVay, 2006). The LEIs sector has three outputs: complete machinery, spare parts and repair service. The LEIs in Bangladesh use an old conventional lathe, boring, milling, shaping,

drilling, grinding etc. machines (EU & INSPIRED, 2013; Talukder & Jahan, 2016).

The LEIs sector in Bangladesh has faced a lot of challenges. Lack of quality raw materials and poor quality of products (Majumder & Dey, 2020a; Talukder & Jahan, 2016), lack of modern technologies (Majumder & Dey, 2020a; Sazzad, 2019; Banik & Swarna, 2018; Talukder & Jahan, 2016; Abdin, 2015), lack of sufficient space to install modern technology-based machine (Majumder & Dey, 2020a); shortage of workforce (Majumder & Dey, 2020a; Talukder & Jahan, 2017), imported LE products with low price (Majumder & Dey, 2020a; Talukder & Jahan, 2016), lack of access to finance (Majumder & Dey, 2020a; Banik & Swarna, 2018; Talukder & Jahan, 2016), lack of industrial facilities (Majumder & Dey, 2020a; Talukder & Jahan, 2016; Sazzad, 2019), lack of policy support (Majumder & Dey, 2020a; Talukder & Jahan, 2016) are major challenges in the LEIs sector of Bangladesh.

Besides, there are a lot of prospects in the LEIs sector of Bangladesh. Poverty alleviation through employment generation (Majumder & Dey, 2020a; Talukder & Jahan, 2017; BFTI, 2016; Karnani, 2011), increasing contribution to GDP (GoB, 2020; Choudhury, 2020; Majumder & Dey, 2020a; Quadir & Mahamud, 2009; Keystone, 2015; MoF, 2016; Begum, 2016), growth of local industry (Majumder & Dey, 2020a; Rahman, 2018), reducing import of LE product (Majumder & Dey, 2020a; Talukder & Jahan, 2016; Begum, 2016; EU & INSPIRED, 2013), increasing export opportunity (Choudhury, 2020; Majumder & Dey, 2020a; Rahman, 2018; USAID, 2019) are main prospects of LEIs sector in Bangladesh. The LEIs sector has been playing an important role in the economy of Bangladesh by supplying useful products and services to agriculture, helping import substitution, besides aiding industrial development (Quadir & Mahamud, 2009).

3. Objectives of the Study

The objective of this study is to investigate the role of the light engineering industries (LEIs) sector in achieving the Sustainable Development Goals (SDGs) of Bangladesh.

4. Methodology of the study

The study was carried out by both qualitative and quantitative approaches. This study is descriptive

and conceptual mainly. Firstly, this study is conducted based on literature review. Secondly, some primary data are collected through observation of industries and in-depth interviews with the key person of respective industries. The study aims to investigate the role of the LEIs sector in achieving the SDGs of Bangladesh. To achieve the objectives of this study, the first step focused on extracting relevant literature on the topic. This study uses Google Scholar, ResearchGate, various academic journals, published books, newspaper articles and internet sources for finding academic literature sources. Resources available through the United Nations and its affiliated organizations are also reviewed. Additionally, sources and reports from other prominent international organizations are used to support the discussion. Some relevant information is collected from the respective association and its training institute through personal communication. Secondly, some relevant information is collected through observation of light engineering (LE) industries and in-depth interviews with the key person of the respective LE industries. Primary data was collected from 35 light engineering industries located at Dholaikhal, Tipu Sultan road, Tahegbagh, Lalbagh and Ashulia in Dhaka; Konabari BSCIC Industrial Estate, Gazipur; Narayongonj and Pathanthuli, Pahartali and Muradpur in Chittagong through a structured open-ended questionnaire with a set of questions.

5. Findings and Discussions

5.1 LEIs Sector and SDG 1 (No Poverty)

The eradication of poverty is the ultimate objective of all development agendas. SDG 1 calls for the eradication of extreme poverty everywhere and halving poverty in all its dimensions over the next 15 years. Inclusive and sustainable industrial development, when adequately linked to formal job markets and health, safety and environmental standards, is widely recognized as having a crucial impact on job creation, sustainable livelihoods, technology and skills development, food security and equitable growth—some of the key requirements for eradicating poverty by 2030. There is evidence that rapid industrialization has lifted several millions of people out of poverty by providing them with jobs and an income (UNIDO, 2020).

Bangladesh has made poverty alleviation as the

major driver of economic salvation in its national plan. All the Five Year Plans (FYPs) from 1973-2020 had the primary focus on poverty reduction. Various strategies such as, expanding employment opportunities, investing in human capital, stimulating women's participation in the labour force, promoting overseas employment, etc. have been adopted by the Government for reducing poverty (GoB, 2020). By 2016, the overall poverty headcount reached 24.3% while it is 56.7% in 1991-92 and 48.9% in 2000 and by 2016, extreme poverty stood at 12.9 % (GoB, 2020). The Perspective Plan 2021-2041 and the 8th Five Year Plan (2021-2025) consider poverty reduction as a major target for transforming Bangladesh into a high-income country by 2041. According to the poverty estimates, the overall poverty and extreme poverty will descend to 2.59% and 0.68% respectively by 2041 (GoB, 2020). A declining trend was shown in the incidence of extreme poverty (population living on less than \$1.90 a day) from 18.5% in 2010 to 14.8% in 2016 and declined average annual poverty is 0.62% (GoB, 2020).

The main driver of poverty reduction in Bangladesh has been income from labour. The LEIs sector continues to support poverty reduction and the economy by creating employment. The LEIs sector has importance in the context of employment generation and poverty reduction in the country (BFTI, 2016). As a labour-intensive sector, the LEIs sector has been playing a vital role to reduce poverty by creating employment opportunities. Employment opportunity has increased the income level of individuals or family. The LEIS sector creates wider opportunities for employment generation in Bangladesh. Around 0.8 million semi-skilled, skilled, and technically educated people, as well as innovative entrepreneurs, work in the approximately 40,000 light engineering industries that operate across the country (BPC, 2015; USAID, 2019). Choudhury (2020) mentioned that the LEIs sector in Bangladesh consists of over 40,000 LEIs and created about 3,00,000 direct employments and at the same time around 30,00,000 indirect job opportunities in different supportive industries. The study reveals that LEIs have needed more workers for meeting the present and future demands of the local market. A study conducted by (BIDS, 2017) projected that the demand for skilled workers would be in the LEIs sector will be increased to 76.95% in 2025-26 fiscal year. On the other hand, various studies

mentioned that LEIs sectors has been faced workforce shortages and it is one of the major challenges in the LEIs sector (Majumder & Dey, 2020a; Talukder & Jahan, 2017). Therefore, the LEIs sector has required a diverse skilled and unskilled workforce. LEIs are scattered throughout the country and, therefore, can generate employment in a wider span of areas (BFTI, 2016).

5.2 LEIs Sector and SDG 4 (Quality Education)

Education is in every sense one of the fundamental factors of development. No country can achieve sustainable economic development without substantial investment in human capital. Education raises people's productivity and creativity and promotes entrepreneurship and technological advances. There is a two-way relationship between industrial development and education. Growth in industrialization creates a high demand for a skilled and trained workforce thereby encouraging education among youth, while at the same time providing revenues that can then be directed towards further developing education (UNIDO, 2020). The SDG 4 emphasizes attaining proficiency in primary and lower secondary education, ensuring access of both boys and girls to quality early childhood development and pre-primary education, ensuring access to quality technical, vocational and tertiary education and eliminating disparities in education and ensuring equal access to all levels of education and vocational training for the vulnerable population especially persons with disabilities, indigenous peoples and children in vulnerable situations.

One of the pre-requisites for enhanced economic growth is to increase the productivity of labour and capital. Productivity can be increased through skills development, training and vocational education and exploitation of appropriate technology, particularly information and communication technology (ICT). One-third of Bangladesh's population is young, and the government is pledge-bound to reach the Agenda 2030 to turn the country's youth group into a well-organized, orderly and productive force. The young generation is being educated, skilled, work-oriented and self-reliant through different projects of Government for training, loan facilities, grants, and employment. For the overall development of the young people, the time-befitting National Youth Policy-2017 has been formulated. To create employment and self-employment opportunities, a total of 2.4 million

young men and women have been imparted training in the last ten years, (GoB, 2020). Skills, knowledge, and innovation are important preconditions for economic and social development. National Skills Development Authority (NSDA) under the Prime Minister's Office has been created to expedite the process of coordination among different stakeholders related to skills develops and needs. The government of Bangladesh has implemented various projects/ programs in the Technical, Vocational Education & Training (TVET) sector such as, "Skills and Training Enhancement Project (STEP)", Bangladesh Skills for Employment and Productivity (B-SEP) Project, Skills for Employment Investment Program (SEIP), etc. to improve the environment for industry skills development to enable increased employability of young and adult job seekers.

The LEIs sector has the potential in achieving SDG 4 by increasing the educational rate and developing skilled manpower in Bangladesh. The study found that most of the workers in the LEIs sector have come from vulnerable communities with never enrolled and drop-out students. After joining as a worker, the LE industry has been providing on-job training and also formal training in basic literacy and numeracy. Without language skills and mathematical knowledge and drawing skills, uneducated workers cannot work and operate LE machinery properly. An apex body of Engineering Industry and Entrepreneurs of Bangladesh, the Bangladesh Engineering Industry Owners' Association (BEIOA) has conducted light engineering related occupation-based training for youth from the vulnerable community with the financial support of the Skills for Employment Investment Program (SEIP), Finance Division, Ministry of Finance, Bangladesh. According to the progress report of BEIOA's light engineering training institute, a total of 13,068 learners with 559 girls received various light engineering-related training from May 2015 to March 2020 period. Secondly, BEIOA and Light Engineering Industry Skills Council (LEISC) have been providing support for conducting training courses and training learning materials for different light engineering-related occupations training for youth incorporated with the Government of Bangladesh, and various public and private institutes.

5.3 LEIs Sector and SDG 5 (Gender Equality)

Women are disproportionately affected; they are more likely to live in poverty due to unequal access to

paid work, education, and property (SDG Fund, n.d.). Gender equality and the economic empowerment of women remain the key challenges in the 2030 Agenda. Women contribute to agriculture and productive businesses and fuel local and global economies. As such, they are fundamental drivers of sustainable development. When women do not participate equally in productive and entrepreneurial activities, economies lose the benefits that would otherwise be provided by new products and services, additional revenues, and new jobs (UNIDO, 2015).

Economic development and modernization have had a profound influence on the lives of both men and women during the past century. Women's participation in the labour force significantly contributes to socio-economic development because of the second source of household income and can help to reduce poverty. Women's employment is a critical factor in their progression toward economic independence and is considered an indicator of their overall status in society (Mammen & Paxson, 2008). In the Population and Housing Census 2011, it is mentioned that women constitute half (80.3 million) of the population composition of Bangladesh and play a very significant role in the economy (BBS, 2012) and about 55.0 million females are aged 15 and above (BBS, 2018). Female participation in the labour force in Bangladesh increased at a significantly more rapid rate than that of men from 2015-16 to 2016-17 fiscal year. According to Labour Force Survey 2016-17, female participation in labour force increased by 4.6%, while male participation in the labour force increased by 1% (BBS, 2018). In Bangladesh, women are often employed at the lower end of the productivity scale. In 2016-2017, the labour force participation of rural women is only 36.3% compared to 83.3% of men (BBS, 2018). A study conducted by Majumder & Dey (2020b) revealed that there is not enough respectable job available for educated women in rural Bangladesh. As a result, most educated women are unemployed and involved in domestic work (such as better taking care of their children and family. Creating employment and income-generating opportunities for women and enhancing their access to social protection are helping reduce their poverty and vulnerability (SDG Fund, n.d.).

The LEIs sector has been playing a proactive role to reduce gender inequality country-wise both the rural and urban. Prior research (Choudhury, 2020;

Rahman, 2018; BPC, 2015; EU & INSPIRED, 2013) mentioned that a total of 40,000 LE industries are scattered in the different parts of the country in both rural and urban areas. Since the LEIs in Bangladesh are scattered in both urban and rural settings, so, there is a lot of employment opportunity for women (especially rural women) in the LEIs sector. The study reveals that more than 70% of workers are female at a production level of electric industries (such as Fan factories, and electrical goods factories) and more than 50% at bi-cycle factories in Bangladesh. But, 40-50% of workers are female at plastic product factories. Presently, women's participation in the labour force has become an essential element in the determination of the performance of economic development, both in developed and developing countries (Che & Sundjo, 2018). The study observed that percentage of women is increased in LEIs, especially production level. It is also observed that a positive change has been made among LEIs' owners regarding creating employment opportunities for women.

5.4 LEIs Sector and SDG 8 (Decent Work and Economic Growth)

Sustained economic growth requires the structural transformation of the economy to activities with higher levels of productivity. Structural transformation towards inclusive and sustainable industrial development serves as an engine to create the competitive job opportunities that are needed today in both developed and developing countries (UNIDO, 2015). By increasing labour productivity, the industry upgrades employment opportunities to higher skill-sets and higher-paid jobs, accompanied by increases in social protection and worker security (UNIDO, 2015). SDG 8 focuses on improving economic growth that is sustainable while also ensuring that the average real income of both employed and unemployed persons, especially in the least developed countries, is improved significantly (GoB, 2020).

Bangladesh has been successful in accelerating economic growth to a higher trajectory in the last decade. After attaining a more than 7% growth rate in three consecutive years, Bangladesh achieved 8.15% real GDP growth in 2018-19, which is the highest in the Asia Pacific region (GoB, 2020). Bangladesh maintained strong macro-economic stability, which contributed, to increasing per capita income, reducing poverty and achieving other socio-economic objectives. The government has set the national development plans

to reach developed country status by 2041. It has recently taken the Delta Plan 2100 linking sustainable development in all national development activities.

The LEIs sector had great potential to contribute to economic development, and GDP growth during the last few decades. The LEIs sector is a big manufacturing sector in the country that contributes about 20% (MOF, 2016) of GDP. In the fiscal year 2012-13, the LEIs sector contributed about 3.08% of the GDP and now it provides at least 50% substitutes of the imported items and has emerged as a potential sector in Bangladesh (Keystone, 2015). The LEIs sector in Bangladesh has an annual turnover of around \$1.6 billion- of which import substitute products are worth around \$200 million (Choudhury, 2020; BPC, 2015).

The LEIs sector is mainly a capital-intensive sector (EU & INSPIRED, 2013). The Government has created many Economic Zones to attract foreign and domestic investment. The investment of LEIs in Bangladesh is about \$15.00 billion and export growth is approximately 30% (Choudhury, 2020). The LEIs sector has been attached as one of the highest priority sectors and a 10% cash incentive is granted for the export of light engineering (LE) products by the government (JICA, 2014; Choudhury, 2020). Exports of light engineering products have reflected a spiraling growth momentum until 2017. Export earnings from the LEIs sector stood at \$510 million in the fiscal year 2015-16, \$689 million in FY 2016-2017, \$355.96 million in FY 2017-2018 (USAID, 2019; Rahman, 2018), and fetched \$293 million in the fiscal year 2019-2020 (Rahman, 2020). Bangladesh Industrial Technical Assistance Centre (BITAC) estimated that export earnings from the LEIs sector are expected to reach \$9.0 billion by 2030 and \$15 billion by 2041 (Rahman, 2018). The present world market size is about \$8 trillion and so there is a good opportunity to export LE Products (Choudhury, 2020). The products are mainly exported to European Union (EU), Japan, China, India, Australia, Africa etc. The LE Products enjoy duty-free access in European and American Markets. Experts believe that the sector has the potential to be a significant foreign exchange earner.

EU is the largest buyer of Light Engineering products from Bangladesh. Further, Bangladesh, being the third largest non-EU exporter of bicycles, has contributed 12% to light engineering exports in the year 2017-18 (USAID, 2019). Then again, the agro-machinery sector is flourishing rapidly with 32% of demand

being met by the light engineering industry. The agro-machinery industry size is \$1.2 billion and growing at a rate of 12% CAGR (Compound Annual Growth Rate). The level of mechanization in the agro-industry is yet to reach its full potential, as only 5 out of 11 core agro-processes have adopted mechanization. This leaves ample area for growth and therefore light engineering implications. The spare parts sector is also progressing rapidly with a market of \$309 million with 80% of products locally produced. The automotive sector is no less, has grown three times in the last 10 years to \$175 million with a CAGR of 10.8% (USAID, 2019).

The core industry of Bangladesh, the Ready-Made Garments (RMG) industry, is a major buyer of light engineering machinery. The LEIs in Bangladesh can supply these products with a huge cost-reduction advantage of 25% compared to imported ones. For example, the cost of LDPE (Low-Density Polyethylene) film blowing machine is \$50,000 if locally acquired, but it is \$700,000 if imported (USAID, 2019). The same is true for many other products manufactured by the LEIs that can serve as import substitutes. In the 8th Five-Year Plan, the government has focused on attracting Foreign Direct Investment (FDI) to facilitate investment in this sector to ease market access and technology pervasion.

The importance of employment as a path way to economic development, social inclusion, and well-being has long been recognized. As economies develop, jobs are reallocated from agriculture and other labour intensive primary activities to industry and finally to the services sector. Since the industrial revolution, manufacturing has been at the core of structural change, consistently creating higher levels of output and employment, and leading to unprecedented growth in incomes (UNIDO, 2013). According to the recent labour force survey of 2016-17 in Bangladesh, informal employment comprises 85.1% with 82.1% male and 91.8% female. The non-agriculture sector, comprising industry and services sectors, accounts for 59.4% of the total employment, formal and informal combined. The proportion of informal employment in the non-agriculture sector employment has increased slightly from 77.5% in 2015 to 78% in 2016 (BBS, 2018).

In Bangladesh, about 40,000 light engineering industries operate all over the country (Choudhury, 2020; BPC, 2015; EU & INSPIRED, 2013). Prior

studies showed that the LEIs sector in Bangladesh has a total of 50,000 micro-enterprises and 10,000 Small and Medium Enterprises (SMEs) (USAID, 2019; Haque, 2013). The LEIs sector in Bangladesh has great potential to contribute to employment generation. Some estimates (Nath, 2012) found that the sector employed around 7,18,000 employees which were 5.51% of total manufacturing employment. Other studies showed that around 0.8 million semi-skilled, skilled, and technically educated people and innovative entrepreneurs are actively engaged in the LEIs sector (USAID, 2019; BPC, 2015). Choudhury (2020) stated that the LEIs Sector of Bangladesh created about 3,00,000 direct employments and at the same time around 30,00,000 indirect job opportunities in different supportive industries. The rapid increase in projected labour demand is the result of high projections of GDP growth, which has been assumed to be sustainable with the same elasticity of employment as experienced during the last decade. According to BIDS (2017), labour demand in Bangladesh has been projected to increase from 63.5 million in 2016 to 88.7 million in 2025. From the year 2021, labour demand will be in oversupply of labour in Bangladesh. The study also projected that the demand for skilled workers would be in the light engineering sector will be increased to 76.95% in the 2025-26 fiscal year (BIDS, 2017). Bangladesh has to develop skilled manpower in every sector. Few other studies identified that the demand for overall manpower in Bangladesh would be higher than its population growth.

5.5 LEIs Sector and SDG 9 (Industry, Innovation and Infrastructure)

Through SDG 9, the Member States of the United Nations (UN) calls upon the international community to “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” (UNIDO, 2015). This SDG 9 acknowledges that industrialization is one of the main drivers of sustained economic growth and sustainable development. This revolves around three interconnected pillars: resilient infrastructure, inclusive and sustainable industrialization and research and innovation, and embracing the common goal of attaining socially inclusive and environmentally sustainable economic development (GoB, 2020). The Government of Bangladesh has taken many initiatives for fostering industrialization through Industrial Policy, SME Policy, Leather Policy and other relevant strategies and

by implementing many development projects. To strengthen the country's industrialization process, the Government of Bangladesh has identified Small and Medium Enterprises (SMEs) as a priority sector and as the driving force for industrialization. SMEs are crucial for implementing the 'Leaving No One Behind' principle that is central to the 2030 Agenda (GoB, 2020).

In Bangladesh, according to Economic Census 2013, there are about 7.8 million SMEs (including the micro & cottage) that employ about 70-80% of the total industrial employment (24 million). The contribution of SMEs to GDP is 25%, however, its industrial contribution is 33% (BBS, 2015). As per SME Policy 2019, by 2024, the contribution of the SME sector in the GDP to be increased from 25% to 32% to implement the development projections of the government (GoB, 2020).

Growth in the local LEIs would increase domestic demand (Foundation, 2013). In Bangladesh, there are about 40,000 light engineering industries (Choudhury, 2020; BPC, 2015; EU & INSPIRED, 2013) and another study mentioned a total of 50,000 micro enterprises and 10,000 Small and Medium Enterprises (SMEs) (USAID, 2019; Haque, 2013) operating all over the country. LEIs sector in Bangladesh has produced various types of products for different sectors. Currently, around 10,000 types of different items are manufactured for local Bangladeshi industries. As demand grows for engineering and electronic goods, so does the demand for light engineering products (Begum, 2016). Several potential export-quality light engineering products are exported directly or through subcontracting such as spare parts of Paper & Cement mills, Bicycle, Fancy light fitting, Construction equipment, Battery, Voltage stabiliser, Iron chain, Cast iron articles, Carbon rods, Automobile spares, Electronics items, Stainless steel wares etc. (Banik & Swarna, 2018). The consumer of LE products and services are both the public and private sectors. Major public sector consumers are sugar and food Industries Corporation, Bangladesh chemical industries corporation, Bangladesh Railway, Bangladesh Road Transport Authority (BRTA), Bangladesh Road Transport Corporation (BRTC), Bangladesh Inland Water Authority (BIWTA), Bangladesh Inland Water Transport Corporation (BIWTC), Port Authority, Water Supply and Sewerage Authority (WASA), Telegraph and Telephone (T&T), Power Development

Board (PDB), Health Engineering, Civil Aviation, and Bangladesh Biman. The private sector is also a major consumer of light engineering products (Haque, 2013).

The LEIs sector in Bangladesh has an opportunity to use modern technologies such as, Computer-Aided Numerically Controlled (CNC) machines and Computer-Aided Design (CAD), Programmable Logic Controller (PLC) machines, Heat Treatment and Testing machines. These machines are critical for the design and production of quality products (Talukder & Jahan, 2016). Presently, the lack of modern technologies is one of the greatest challenges in the LEI sector of Bangladesh (Majumder & Dey, 2020a; Sazzad, 2019; Banik & Swarna, 2018; Abdin, 2015). Lack of positive attributes regarding technology up-gradation and scale-up of operation (Majumder & Dey, 2020a; Talukder & Jahan, 2017); lack of sufficient space to install modern technology based machines (Majumder & Dey, 2020a); lack of access to finance for the sector investors (Majumder & Dey, 2020a; Banik & Swarna, 2018; Talukder & Jahan, 2017) and Lack of policy support (Majumder & Dey, 2020a; Talukder & Jahan, 2016) are major reasons of not upgrading modern technologies. However, according to Bangladesh Foreign Trade Institute (BFTI), the quality of productivity could not be raised to the global standards due to the absence of modern technology and required machinery (Sazzad, 2019). Therefore, about 30-40% of raw materials were wastage and it affects in cost of the unit product (Banik & Swarna, 2018). The modern technologies and machinery have perfect and accurate settings. So, modern technologies and machinery are required to meet domestic and global market demand (Majumder & Dey, 2020a).

5.6 LEIs Sector and SDG 10 (Reduced Inequalities)

Poverty cannot be eradicated without addressing the pervasive inequalities in income and economic opportunities between and within populations, countries and regions (UNIDO, 2015). The SDG 10 focus on reducing inequities and inequality both between and within countries, by tackling marginalization and ensuring that the needs of the poorest are central to the achievement of all goals (UN, 2015). The disparities in opportunities, wealth and power are skyrocketing day by day and without proper intervention, the dream of an egalitarian world will remain unfulfilled. Industrial development creates the conditions to tackle inequality in both

developed and developing countries, through the provision of greater productivity, stable employment, increased incomes and opportunities for social mobility. Currently, the industry is a major driver of employment globally, contributing to almost 500 million jobs, or 20% of the global labor force (UNIDO, 2015). Bangladesh is committed to efface inequalities and made it a national agenda. Among its other prominent features, the LEIs help to create SME regional dispersion as they are mostly established in remote areas of the country. This helps it create a link between manufacturing industries and agricultural components within the country while reducing rural poverty at the same time (Begum, 2016).

40,000 LEIs (Choudhury, 2020; Rahman, 2018; BPC, 2015; EU- INSPIRED, 2013) have been operating all over Bangladesh in rural and urban settings, so the LEIs have created a lot of employment opportunities in rural and urban areas separately. As a result, it helps to reduce regional inequality. Secondly, since there is not enough respectable job available for educated women in rural areas (Majumder & Dey, 2020b), LEIs have provided employment opportunity for those women and contributes to reduce gender inequality. Further, since the LEIs sector is labour intensive sector, therefore LEIs sector has created employment opportunities for workers with skills or un-skills and un-educated from the vulnerable communities with never enrolled and drop-out students. Bangladesh Institute of Development Studies (BIDS) projected that the demand for skilled workers would be in the LEIs sector will be increased to 76.95% in 2025-26 fiscal year (BIDS, 2017). So the LEIs contribute to reduce inequalities of sex, age, disability, race, class, ethnicity, religion, etc.

5.7 LEIs Sector and SDG 11 (Sustainable Cities and Communities)

The processes of urbanization and industrialization are usually closely intertwined since it allows societies to take advantage of agglomeration economies (UNIDO, 2015). Well-managed cities that are highly connected can use technology effectively to enable greater equity and inclusion, can improve societal wellbeing and achieve greater economic growth at lower rates of resource use, greenhouse gas emissions, and social costs. In this context, green industries, as providers of environmental goods and services, can help combine greater productivity and innovation with lower costs and reduced environmental impacts while providing

the environmental services needed by municipalities to improve city living (UNIDO, 2015).

Most urban centers in Bangladesh face problems with the collection and disposal of urban solid waste due to the rapid growth of urbanization, urban population and urban economic activities (GoB, 2020). The LEIs sector in Bangladesh has been playing a role in achieving SDG 11 'Make Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable' through promoting smart industries and industrial clusters in urban industrial zones. In Bangladesh, the LEIs have grown in clusters. Clustering creates the opportunity to attain efficiency gains which are rare possible by individual firms and it is a matter in developing countries where clustering helps small firms to overcome well-known growth constraints (Schmitz, 1999). The cluster offers interesting opportunities for upgrading and modernization of local firms (Pietrobelli & Rabelloti, 2006). It provides the opportunity to arrange a support system including infrastructure, targeted loan, product sourcing, staff training, common facilities centers, etc. (Talukder & Jahan, 2016). Although, LEIs in Bangladesh are scattered in all cities, towns and growth centers. However, according to SME Foundation, a total of 31 light engineering clusters located in 18 districts of Bangladesh have been identified (Foundation, 2013). Most of the industrial units are located in Dhaka, Chittagong, Narayanganj, Bogra, Gazipur and Kishorganj. There are some traditional clusters of LEIs such as the old town of Dhaka city, the industrial zone of Khulna and Gazipur, northern parts (Bogra, Noug, Pabna) of the country, major land and water transport stations like Narayangong, Chittagong, Jessore (Haque, 2013). Each of the clusters has some particular characteristics that give it a particular designation. For example- clusters in Bogra concentrate on foundry and agro-machineries, and clusters in Rangpur focus on spare parts (Haque, 2013). To develop the LEI, the Government of Bangladesh has undertaken a plan to establish 'A Light Engineering Cluster Village' near Dhaka. The Government of Bangladesh has created many Economic Zones to attract foreign and domestic investment. The LEIs sector has been allocated 36% of the industrial area of Mirershorai Economic Zone (Tahsin, 2020, March 25).

The LEIs belong to the smart industry category as per the country's environmental regulations. Smart industry category manufacturing firms are, by and

large, free from environmental hazards (Talukder & Jahan, 2016). The LEIs produce only solid waste and these are recyclable. The wastes of the cutting process are known as 'Babri' which are sold at high prices and are recycled to make raw materials. There is no chemical or fly ash disposal in these factories. So, the LEIs sector is environment friendly (Talukder & Jahan, 2017)

5.8 LEIs Sector and SDG 12 (Responsible Production and Consumption)

Sustainable Consumption and Production (SCP) is defined as "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations" (GoB, 2020). Environmental concerns are integrated into several goals, calling for sustainable and efficient production patterns and encouraging sustainability certification for industry (UNIDO, 2015). The SDG 12 aims at decoupling economic growth from environmental damage and natural resource exploitation.

The Government of Bangladesh has adopted policies and strategies to promote sustainable production, consumption, and disposal patterns in the economy (GoB, 2020). Many of these policies and strategies have been highlighted in the National Sustainable Development Strategy (NSDS) adopted by the government in 2013. As economic development is one of the major indicators for future consumption, the country needs to be prudent in utilizing natural resources and minimizing the impact on the environment through material and non-material consumption including food consumption. As the country is being rapidly urbanized, the negative externalities like air and water pollution, and waste generation particularly solid waste, medical waste, and electronic waste are increasing. If we could not able to manage these negative externalities properly, the development of the country will not be sustainable in the coming future (GoB, 2020).

The LEIs in Bangladesh produce only solid waste. Due to discharging solid waste, these LEIs belong to the green category as per the country's environmental regulation. Green category manufacturing firms are, by and large, free from environmental hazards (Talukder & Jahan, 2016). Talukder and Jahan (2016)

also mentioned that the congested clusters of LEIs have poor waste disposal systems and the safety and working environment in this LEIs sector are poor. It is clearly understood that for increasing productivity and improved safely working environment these solid wastes are to be disposed of as per standards. The study observed that a positive change has been made among the LEIs owners and workers about improving waste management and the working environment. The LEIs owners and their respective associations have taken various initiatives to increase awareness and management regarding waste management and the working environment in the LEIs sector.

5.9 LEIs Sector and Goal 13 (Climate Action)

With rising greenhouse gas emissions, climate change is occurring at rates much faster than anticipated and its effects are felt worldwide. The climate change implications of environmentally unsustainable industrial activities are unquestionable. The industry is estimated to account for one-third of global CO₂ emissions alone (UNIDO, 2015). The SDG 13 focus on strengthening resilience and adaptive capacity to climate-related hazards and natural disasters, integrating climate change measures into national policies, strategies, and planning, improving education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.

Bangladesh is one of the most proactive developing nations that has considered the issue of climate change seriously and subsequently achieved success in developing national-level scientific expertise and government-level actions. Concerning disaster management and risk reduction, Bangladesh is now considered a global role model. Between 1980 and 2008, Bangladesh experienced 219 natural disasters, causing a total of over US\$16 billion in damage, affecting 135 million adversely. Disasters in Bangladesh are mostly linked to climate change. Now, after the government has trained 65,000 volunteers and prepared 25,000 communities to respond to any disaster, the country's response posture has moved from reactive relief to proactive risk reduction. The results are apparent in the fewer lives and livelihoods destroyed by natural disasters nowadays (GoB, 2020).

The LEIs sector has played a vital role in Mitigation and adaptation to climate change. Several authors (Majumder & Dey, 2020a; Sazzad, 2019; Talukder & Jahan, 2016) mentioned that more than 90% of raw

materials in the LEIs sector in Bangladesh come from ship-breaking industries. Re-use of scrap iron and steel from the shipbreaking industry is an environment-friendly activity since it reduces the need for mining for the production of raw metal in the steel industry from pig iron (Zakaria et al., 2012). From an energy saving and emission point of view, the production per ton of steel from scrap requires more than 5 times less energy and 7 times less CO₂ emission compared to steel production from iron ore (Neser et al., 2008).

6. Conclusion and Recommendations

The LEIs sector has emerged as the foundation of development providing the platform for industrial growth, enhancement of trade, and economic prosperity. The LEIs have the potency to play a significant role in technological and economic development along with a vast scope of employment generation (Haque, 2013). The study aims to investigate the role of the light engineering industries (LEIs) sector in achieving the SDGs of Bangladesh. To achieve the objectives of this study, the study focused on extracting relevant literature. This study uses Google Scholar, ResearchGate, various academic journals, published books, publications of the United Nations and its affiliated organizations, newspaper articles and internet sources for finding academic literature sources. The study revealed that the LEIs have been playing a proactive role to make progress toward achieving various SDGs in Bangladesh. The LEIs sector has the potential to contribute more in terms of reducing poverty (SDG 1) and economic growth (SDG 8) with significant employment generation. The link between economic growth and poverty reduction is mediated by job creation. The LEIs sector in Bangladesh has a total of 50,000 micro enterprises and 10,000 Small and Medium Enterprises and around 0.8 million semi-skilled, skilled and technically educated people and innovative entrepreneurs are actively engaged in the LEIs sector and at the same time around 30,00,000 indirect job opportunities in different supportive industries.

The LE industry has been providing on-job training and also formal training along with basic literacy and numeracy which is playing a vital role to achieve SDG 4. It is observed that the LEIs have needed more workers for meeting the present and future demands of the local market. Skilled labour demand projected


in the LEIs sector will be increased to 76.95% in 2025-26 fiscal year. The study also illustrates that the LEIs sector has also been playing a proactive role to reduce gender inequality (SDG 5) country-wise both rural and urban areas (SDG 10). As the LE industries in Bangladesh are scattered in both urban and rural settings, so, there are a lot of employment opportunities for women (especially rural women) in the LEIs sector.

During the previous few decades, the LEIs sector has had a significant impact on economic development (SDG 8) and GDP growth. The LEI sector is a big manufacturing sector in the country that contributes about 20% of GDP. In the fiscal year 2012-13, the LEI sector contributed about 3.08% of the GDP and provides at least 50% of substitutes for the imported items in Bangladesh. The LEIs sector in Bangladesh has an annual turnover of around \$1.6 billion of which import substitute products are worth around \$200 million. Consistent with the notion, this sector's export earnings are \$689 million in FY 2016-17, \$355.96 million in FY 2017-18 and fetched \$293 million in the fiscal year 2019-20 and estimated export earnings \$9.0 billion by 2030 and \$15 billion by 2041.

Domestic demand would be boosted by local industrial growth (SDG 9). In Bangladesh, there are 50,000 micro enterprises and 10,000 SMEs functioning across the country, helping to alleviate inequality in both rural and urban areas (SDG 10). For native Bangladeshi enterprises, over 10,000 different sorts of commodities are currently manufactured. Several light engineering products with export potential are shipped directly or through subcontracting (SDG 9). In Bangladesh, the LEIs sector has a lot of opportunities to apply new technologies (SDG 9) including various modern machines.

In Bangladesh, the LEIs have grown in urban industrial zones (SDG 11) in clusters. According to the country's environmental regulation, LEIs belong to the green industry category (SDG 11). Green industry category manufacturing firms are, by and large, free from environmental hazards. Only solid waste (SDG 12) is generated by LEIs. These wastes can be recycled. These factories do not dispose of any chemicals or fly ash. Therefore, the LE sector is environmentally supportive (SDG 13). Scrap iron and steel from the shipbreaking industry make up around 90% of the raw materials. This is an environmentally favorable activity since it decreases the need for mining to produce

raw metal for the steel industry from pig iron. As compared to steel manufacturing from iron ore, scrap steel consumes more than 5 times less energy and emits 7 times fewer CO₂ (SDG 13).

According to the above discussion and findings of this study, the study recommended that since there are no precise statistics on the number of LEIs in Bangladesh, the government should take an initiative to develop a database of LEIs including their potentiality, products, technology, existing and future demand of manpower in all over the country. The government should adopt a mega program to create a skilled workforce to meet the future needs of the LEI sector through the National Skills Development Authority (NSDA), so that Bangladesh could be achieved the SDGs by 2030 and fulfills Vision 2041. Since the LEIs sector in Bangladesh has a lot of opportunities to use modern technologies and belongs to the green industry category as per the country's environmental regulation and environment friendly and capital incentive sector, the government, and financial institute should take initiative for investment in the LEIs sector with flexible conditions and low rate of interest with long term installment. The government should set up light engineering cluster villages with all kinds of industrial facilities in different parts of the country and also should adopt a separate national light engineering policy for overcoming existing challenges. 

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Annexure I: Sustainable Development Goals

Goal 1	End poverty in all its forms everywhere
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5	Achieve gender equality and empower all women and girls
Goal 6	Ensure availability and sustainable management of water and sanitation for all
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10	Reduce inequality within and among countries
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development