International Research Journal of
BUSINESS STUDIES

ISSN: 2089-6271 | e-ISSN: 2338-4565 | https://doi.org/10.21632/irjbs

Vol. 14 | No. 3

Bangladesh RMG Supply Chain Vulnerabilities To Disruption Beyond Covid-19

Nayem Uddin Hoque Tusher

Department of Marketing, University of Chittagong, Chittagong 4331, Bangladesh

ARTICLE INFO

Keywords:
Covid-19,
Bangladesh RMG,
Supply Chain,
Vulnerability,
Disruption

Kata Kunci:
Covid-19,
Bangladesh RMG,
Rantai Pasokan,
Kerentanan,
Disrupsi

ABSTRACT

With the recent outbreak of Covid-19, the fragility of the global SC has been revealed. Significant disruption from both the demand and supply side has jolted the garment industry of Bangladesh. This paper aims to foster a more explicit understanding of the disruption vulnerability factors of the Bangladesh RMG SC beyond Covid-19. To achieve this aim, an exploratory study methodology is used by extensive literature review. Analysis revealed that Bangladesh RMG SC is vulnerable to hazard, strategic, financial, operational, infrastructural, and demand and supply factors. Natural calamities, infrastructural collusions, labor and political unrest, globally intensified competition, non-compliance issues, high dependency on imported materials, lack of product, and market diversification can lead Bangladesh RMG SC to disruptive events. The analysis of this study will help factory owners, industrial managers, and designated authorities to identify vulnerabilities associated with the Bangladesh RMG SC and take measures to reduce the vulnerabilities to disruption.

Corresponding author:
tusher.cu@gmail.com

SARI PATI

Dengan merebaknya Covid-19 baru-baru ini, kerentanan SC global telah terungkap. Gangguan signifikan dari sisi permintaan dan penawaran telah mengguncang industri garmen Bangladesh. Makalah ini bertujuan untuk mendorong pemahaman yang lebih eksplisit tentang faktor kerentanan gangguan dari RMG SC Bangladesh di luar Covid-19. Untuk mencapai tujuan tersebut, metodologi studi eksploratif digunakan dengan tinjauan pustaka yang luas. Analisis mengungkapkan bahwa Bangladesh RMG SC rentan terhadap bahaya, strategis, keuangan, operasional, infrastruktur, dan faktor permintaan dan pasokan. Bencana alam, kolusi infrastruktur, perburuhan dan kerusuhan politik, persaingan yang intensif secara global, masalah ketidakpatuhan, ketergantungan yang tinggi pada bahan impor, kurangnya diversifikasi produk dan pasar dapat membawa Bangladesh RMG SC ke peristiwa yang mengganggu. Analisis studi ini akan membantu pemilik pabrik, manajer industri, dan otoritas yang ditunjuk untuk mengidentifikasi kerentanan yang terkait dengan RMG SC Bangladesh dan mengambil tindakan untuk mengurangi kerentanan terhadap gangguan.

INTRODUCTION

In this era of globalization, supply chain networks of global business operations are becoming more uncertain with the increasing complexities. Bangladesh is one of the largest exporters of readymade garments (RMG), whose supply chain network is vulnerable to increased risks of disruption for its global supply chain networks (N. A. Chowdhury et al., 2019). The outbreak of the Covid-19 pandemic has unprecedentedly jolted the global economy and supply chains. As a key player in the global garments industry, Bangladesh has experienced a severe Covid-19 pandemic. Due to the unprecedented outbreak of Covid-19 at the very beginning of 2020, the Bangladesh RMG supply chain became more vulnerable to disruption due to the lack of raw material supply from China, buyers' bankruptcy, cancellation of the order, and decrease in demand. According to World Trade Statical Review (2020), the global demand for clothing decreased by 37 percent in April 2020 due to the Covid-19 outbreak. The purchasing managers' indices (PMIs) of manufacturers' export orders fell sharply to 27.1 in April 2020, compared with a baseline value of 50 (WTO, 2020). As a result, Bangladesh RMG export sharply falls from 34 billion dollars in 2019 to 27 billion dollars in 2020 (EPB). Furthermore, a survey conducted among 250 factories reported that 38 percent of factories experienced order reductions or shipments postponement, 34 percent faced order cancellations, while 4 percent of factories stopped production due to the disruption in raw material supply (ILO, 2020b).

Disruption risk is one of the most significant risks in the supply chain (Roehrich et al., 2014), which causes fluctuation in product quality, transportation, and price. This fluctuation, in turn, impacts the apparel market. In addition, fluctuations in the forecasted demand occur due to the shorter product life cycle and wide product variety. Seasonality in demand and long lead times amplify the fluctuations. The overall consequence of the rapid fluctuations is either undesired inventory or shortage (Ali et al., 2018; Yan et al., 2018). Poor transportation system causes inefficiencies in the supply chain due to delay in getting supply and making delivery (Ko et al., 2017), which creates bull-whip effects and affects inventory cost (Fattahi et al., 2017).

Apparel brands started sourcing from the low-cost country (LCC) in the early 1990s (Bozarth et al., 1998; Stanczyk et al., 2015). Though China was the early supplier of apparel products to the western brands, increasing labor costs forced them to move to other low-cost countries such as Vietnam, Thailand, Cambodia, Malaysia, India, and Bangladesh (Gereffi and Luo, 2015). As a large proportion of global apparel is produced in these low-cost Asian countries, the industry is highly exposed to supply chain risks (WTO, 2018). Handfield et al. (2020) found that Bangladesh and other low-cost countries possess significant long-term supply chain disruption risks associated with human resources, workplace safety, inflation, and social welfare that require mitigative measures.

The readymade garment industry is a major contributor to the economy of Bangladesh. It is the second-largest apparel exporter with 6.8 percent of the global market share in 2019, making $34 billion worth of exports in the fiscal year of 2018-19. It is projected that Bangladesh will become the 25th largest economy in the world by 2035 (CEBR, 2020). There are more than 4600 export-oriented garment factories, and more than 4 million workers are employed. All the garment companies in Bangladesh act as subcontractors and produce performing cutting, making, and trimming (CMT) activities (M. S. Islam & Liang, 2012). The supply chain of the Bangladeshi RMG sector is complex due to its high dependency on imported raw materials. In the year of 2019, Bangladesh has exported 34 billion dollars of garments clothes and imported 10 billion dollars of textiles (WTO, 2020). The supply chain process also has different obstacles related to government, tariffs, exchange rates, consumer requirements, and

business operations and experiences the effect of a decentralized supply chain and conflicting goals. Bangladesh's RMG sector has experienced many devastating incidences, which have killed hundreds in recent years (Quadir, 2019). The deadliest accident was the collapse of Rana Plaza in 2013, followed by a fire in Tazreen Fashions that caused the death of more than 1100 workers. In 2012, a fire in Tazreen Fashions exposed the opacity of the global supply chain for clothing (Manik & Yardley, 2013). From 1990 to 2016, there were almost 69 incidents occurred in the Bangladeshi RMG sector (Morshadul Hasan, 2017). These deadliest accidents created significant brand-related risks due to responsible protests from consumer markets (Anner et al., 2013, 2016). Anger and frustration that follow such industrial accidents can lead to protests, strikes, and work stoppages that can further disrupt supply chains (Jacobs & Singhal, 2017). Despite industrial accidents, competitive vulnerability, and exposure to supply chain disruption, buyers prefer Bangladesh to source cheap labor costs and massive production capacity.

LITERATURE REVIEW

Supply chain vulnerability

Supply chain vulnerability has been defined broadly by Svensson (2000) as "the existence of random disturbances that lead to deviation in the supply of components and materials from normal, expected or planned schedules or activities all of which cause negative effects or consequences for the involved manufacturing and its sub-contractors". Christopher & Peck (2004) defined supply chain vulnerability "an exposure to serious disturbance, arising from risks within the supply chain as well as risks external to the supply chain". (Jüttner et al., 2003) defines as "the propensity of risk sources and risk drivers to outweigh risk mitigation strategies, thus causing adverse supply chain consequences". (Wagner & Bode, 2006) state that "supply chain vulnerability is a function of certain supply chain characteristics and that the loss a firm incurs is a result of its supply chain vulnerability to a given supply chain disruption". A firm's "vulnerability" to a disruptive event can be viewed as a combination of the likelihood of a disruption and its potential severity (Sheffi, 2005). Several publications mention how certain supply chain characteristics might increase or decrease the vulnerability of the supply chain.

Customer dependence, supplier dependence, supplier concentration, single sourcing, and global sourcing increase the supply chain vulnerability (Wagner & Bode, 2006). Supplier dependence occurs when a sourcing firm becomes dependent on a supplier for its inputs (or more suppliers) due to few alternative sources (Hibbard et al., 2001). On the other hand, Customer dependence is viewed as the dependency on a few customers, e.g., because of lack of market diversification. In such a case, customers hold strong bargaining power. As a result, the focal firm might get vulnerable to demand. Supplier concentration by rationalizing the supply base increases the supply chain vulnerability due to the lack of ability to switch to other suppliers in disruptive events (Svensson, 2004). In contrast to single sourcing, which is an extreme scenario of supplier concentration, global sourcing is beneficial to an organization as it can utilize the parameters such as the suppliers' location, product quality, and mode of transportation. However, it increases uncertainty lowers transparency and visibility compared to local sourcing. In addition, it amplifies the structural complexity of the supply chain (Hendricks & Singhal, 2005).

Supply Chain Vulnerability Factors

Effective management of a supply chain has become challenging and difficult due to the complexity of the supply chain and overwhelming disruption in recent times. The consequence of these disruptive events has made the supply chain vulnerable (Jüttner & Maklan, 2011). Maintaining an effective Supply Chain (SC) has become stimulating and difficult as the supply chains are inherently complex and, in recent times, are overwhelmed with disruptive events. These disruptive events make a supply chain vulnerable, as supply chain vulnerability is the susceptibility of the supply chains

to the consequences of disruptive events (Blos et al., 2009; Jüttner & Maklan, 2011). Vulnerability arising from the customer side, supplier side, and supply chain design issues are the determiners of the vulnerability in a supply chain (Wagner & Bode, 2006). Moreover, supply chain vulnerability may also arise from transportation delay, port strikes, natural calamities, poor communication, demand variability, supply shortage, operational problems, terrorist attack, and many more (Colicchia et al., 2010; Blackhurst et al., 2008; Kleindorfer & Saad, 2005). (Schmitt et al., 2015) studied how both centralization and decentralization of multi-location systems impact supply disruptions. According to the findings of Kleindorfer & Saad (2005), operational factors, natural hazards, and political turbulence are the main sources of supply chain vulnerability. Operational factors include equipment and systemic failures, water and power supply issues, labor unrest, and many others. Earthquakes, floods, and cyclones are among others that are related to natural hazards. Blos et al. (2009) identified four key sources of supply chain vulnerabilities such as vulnerability associated with finance, strategy, hazard, and operations. Similarly, a summary of the specific supply chain vulnerability discussed by different is given in Table-1 in terms of related vulnerability factors.

Supply Chain Disruption

Supply chain disruption risks refer to events that might emerge in supply chains and influence the flows of materials and components (Svensson, 2000). (Craighead et al., 2007) defined disruptions as unexpected events that expose the financial and operational risk of a supply chain by hampering its normal physical, informational and financial flow. These unexpected events can be defined as having uncertainty in the supply chain and causing severe disruptive effects. The effects of disruptions are inability to acquire supplies, loss of shipment, inability to convert, inability to meet demand, unavailable credit, and reputational loss. The severity of a disruptive event within a supply chain is positively correlated with the density and complexity of a supply chain and exacerbated with the criticality of purchased items (Craighead et al., 2007). The density of a supply chain can be determined by the geographical spacing of suppliers. Lean and efficient supply chains of complex networks are highly vulnerable to severe disruptions due to delays in finding quick alternatives (Ivanov & Dolgui, 2019, Wong et al., 2002). As a consequence of supply chain disruptions, shareholder value declines significantly (Hendricks & Singhal, 2003).

Supply chains disruption risks generally arise from natural disasters, political instability, and other factors or events connected with the flow aspects of the supply chain, such as inability to connect or process, demand volatility and human errors, or a combination of several such factors (Sheffi, 2001). The nature and timing of the impacts of disruptive events vary. A labor union issue can be predicted, whereas a terrorist attack is a random event. The operational disruption due to a fire in a factory is immediate, while the outbreak of an epidemic slowly affects a supply chain (APICS, 2016). Whereas natural disasters occur suddenly irrespective of the preparations and vigilance of companies, other types of disruptions become less likely for the well-prepared and attentive. However, supply chain connectivity and dependence on shared resources can cause a careful company to experience disruption by the carelessness and bad luck of others (Sheffi, 2015). The magnitude of disruption is a factor of the organization's contingency plan and the inherent resilience of its supply chain (Sheffi, 2005).

METHODS

This paper is mainly based on a literature review and is exploratory in nature. Secondary and pertinent literature was reviewed for the study. Secondary data is carried out through a detailed study of the relevant journals, research papers, books, write-ups, and reports concerning the RMG industry of Bangladesh by experts of various fields and theoretical knowledge.

Table 1. Supply chain vulnerability factors

Vulnerability Factors	Specific Vulnerability	References
Hazard vulnerability	Natural disaster (flood, cyclone)	(Blackhurst et al., 2008; Kleindorfer & Saad, 2005; Sheffi & Rice, 2005; Tang & Tomlin, 2008; T. Wu et al., 2006; Christopher & Peck, 2004)
	Political instability	(Blackhurst et al., 2008; Kleindorfer & Saad, 2005; Sheffi & Rice, 2005; T. Wu et al., 2006)
	Fire and other accidental damage	(Blos et al., 2009)
	Labor unrest	(Blackhurst et al., 2008; Kleindorfer & Saad, 2005; Sheffi & Rice, 2005; T. Wu et al., 2006)
Strategic vulnerability	Increased competition	(Blos et al., 2009; Haider, 2007)
	Non-compliance of social and environmental factors	(A. M. Islam & Deegan, 2008)
	Problem of relation with buyer & suppliers	(Blos et al., 2009)
	Problem of integration and real-time information	(Gaudenzi & Borghesi, 2006)
Financial vulnerability	Currency fluctuation	(Blackhurst et al., 2008; Blos et al., 2009)
	Economic recession	(Blos et al., 2009)
	Raw material price fluctuation	(Blos et al., 2009)
	Bankruptcy of supply chain members	(Blos et al., 2009)
	Higher rate of bank interest	(Blackhurst et al., 2008; Blos et al., 2009)
Operational vulnerability	Shortage of skilled worker	(Haider, 2007)
	Switching and absenteeism of workers	(M. M. H. Chowdhury & Quaddus, 2015)
	Fault in production planning and inventory management	(M. M. H. Chowdhury & Quaddus, 2015; T. Wu et al., 2006)
	Failure of IT system and machineries	(Blos et al., 2009)
	Disruption in utility supply	(Blos et al., 2009)
	Product quality defection (poor quality)	(Blos et al., 2009)
	Machinery breakdown and failure	
	Illiteracy of workers and supervisors	(M. M. H. Chowdhury & Quaddus, 2015)
Infrastructural vulnerability	Delay in custom clearance	(Colicchia et al., 2010)
	Delay for Congestion and inefficiency in port	(Blackhurst et al., 2008; Colicchia et al., 2010)
	Delay in transportation for poor infrastructure and port facilities	(Blackhurst et al., 2008)
	Strike by port workers	(Blos et al., 2009; Colicchia et al., 2010)
Demand & supply vulnerability	Suppliers' delay	(Blackhurst et al., 2008)
	Dependence on imported material and lack of backward linkage	(Craighead et al., 2007; Haider, 2007; Nurruzaman et al., 2016)
	Lack of alternative for some critical items	(Craighead et al., 2007)
	Defection or nonconformity of material	(Blackhurst et al., 2008)
	Opportunism of buyers (expect discount)	(Ponomarov & Holcomb, 2009)
	Demand fluctuation/uncertainty	(T. Wu et al., 2006)
	Suppliers opportunism	(Ponomarov & Holcomb, 2009)

Source: M. M. H. Chowdhury & Quaddus (2015)

FINDINGS AND DISCUSSION

Hazard vulnerability

Natural hazard

Bangladesh is vulnerable to climate change and subsequent natural disasters every year. According to (World Bank, 2018), more than 80 percent of the population is potentially exposed to floods, earthquakes, and droughts, and more than 70 percent to cyclones. On average, the country experiences severe tropical cyclones every three years, and about 25 percent of the landmass is inundated with floodwaters every year. Severe flooding occurs every 4-5 years and covers 60 percent of the landmass. In addition to the loss of lives and severe infrastructure damage, these extreme weather events are accompanied by an inflationary environment.

Accidental

The collapse of Rana Plaza is the largest industrial accident that caused the death of 1134 people. The cause of the Rana Plaza accident was the structural weakness of the building to vertical load due to a violation of the provisions of the Bangladesh National Building Code (BNBC) (Ansary & Barua, 2015). Following the accident of Rana Plaza, an assessment of 3746 RMG factory buildings under NPTA for vertical load vulnerability identified 2.3 percent as highly vulnerable, 42.7 percent as moderately vulnerable, and 24.4 percent as slightly vulnerable (Ansary & Barua, 2015). Also, there are vulnerabilities related to potential earthquakes. An earthquake of only medium magnitude on the Richter scale can cause substantial damage in the country (CDMP 2009), where there is a possibility of a high-magnitude earthquake in Bangladesh ranging from 8.2 to 9.0 on the Richter scale (Steckler et al., 2016). In addition, most factory buildings do not have a sufficient gap with the adjacent buildings. Due to the inadequate gap, the magnitude of the pounding of effect on closely clustered factory buildings as a result of the earthquake can increase and cause serious structural and local damage (Das et al., 2018; Hao, 2015).

Fire-related accidents are frequent in Bangladesh. From 2001 to 2016, 69 incidents of the previous year, 94.2 percent incidents occurred by fire (Morshadul Hasan, 2017). Most of the accidents were caused due to electric short-circuits and chemical explosions on the factory floor. Wadud & Huda (2017), surveying 60 factories in Dhaka city, found that a mean Fire Risk Index (FRI) of 2.58 and 1.82 on a scale of 4 for structural factors and 'in-use' safety, respectively. The result indicates a poor and alarming safety condition in the factories. A report from Accord in October 2020 showed that 1,308 factories yet to have their fire alarm and detection system, 1,114 factories yet to have their fire suppression system, 972 factories yet to have all safe egress measures implemented and verified to standard, and 399 factories yet to complete structural remediation based on an engineering assessment out of 1593 factories inspected.

Political instability and labor unrest

Labor unrest is a very common and recurrent issue in the garment industry of Bangladesh. Workers of a garment factory suspended production and demonstrated on the road demanding due payment, overtime allowance, and maternity leave allowance amid the Covid-19 outbreak ("RMG Workers Demo", 2020). According to the survey of the Bangladesh Institute of Labour Studies (BILS), a total of 264 labor movements were fomented in the RMG sector in 2020. Labor unrest causes a massive loss of production. In worst cases, the protesters ruin the factories. The clash between law enforcement agencies and garment workers generates a turbulent situation in this industry. The key factors which are representing labor unrest are working environment, wages and payment, overtime and leave, the relationship between labor union and owner, and violent political effect (Roy, 2020). The RMG sector has many dissatisfaction issues to increase labor unrest in this sector. According to the Bangladesh Govt's additional Gazette (2018), the low labor wage in Bangladesh is BDT 8000 per month, which is not sufficient for workers to

survive. The most important reasons are unpaid wages and delayed payment (Choudhury & Rahman, 2017). Case received by Conciliation-cum-Arbitration Committee (CAC) 8,050 cases and 53 percent cases related to unpaid wages and overtime.

Strategic vulnerability

Rising of competitor

The RMG sector of Bangladesh had been facing fierce competition in the global apparel market After the abolition of the MFA (Nurruzaman et al., 2016). Though Bangladesh has been able to offer low prices by utilizing the availability of a large number of cheap labor, it remains vulnerable to various competitive forces (Park-Poaps et al., 2020). Vietnam, India, and Turkey are the closest competitors of Bangladesh (Table-2). According to the World Economic Forum's Global Competitiveness Report (2019), Bangladesh stands at a low position of 105th, With Turkey, Vietnam, and India ranked at 61st, 67th, and 68th, respectively.

RCEP agreement is signed by the 15 member countries, including 10 ASEAN countries, two of which, Myanmar and Lao PDR, will be graduating in coming years, similar to Bangladesh, will intensify competition in garment industries (M. Rahman, 2020). In addition, apparel made by Bangladesh is mostly basic items that are highly price elastic and have substitution (Dickerson, 1995; Saxena, 2014). RCEP members are capable of acquiring more shares in leading apparel exporting destinations by offering more competitive prices based on a more efficiently integrated supply chain of textile and apparel facilitated RCEP trade agreement (Dicken, 2015). Moreover, if the wage cost effects are not considered, production cost in Bangladesh is higher than most of its competitors due to poor infrastructure and unreliable utility supply (M. T. Rahman et al., 2017). Lu (2019) found that RCEP members could source locally made textile in the RCEP area due to low trade costs. As a result of intensified competition from RCEP members that make identical products targeting the same export markets, Bangladesh would be vulnerable to rising competition and could experience a decline in its exports (Lu, 2019).

A number of investors shift their production facilities to Vietnam, considering its political stability (Lomas, 2017). Vietnam is the second-largest trading partner of the EU in the Association of Southeast Asian Nations (ASEAN) bloc. The EU is also a major export destination for Bangladesh RMG accounts for 61 percent of all apparel exports from Bangladesh in the fiscal year 2019-20 (EPB). Vietnam has signed a bilateral FTA with the EU and is also a member of the CPTPP and RCEP. In addition, Vietnam also signed FTA with the UK after Brexit at the very end of 2020. In contrast, Bangladesh struggles to yet establish similar FTA or bilateral trade agreements with the

Table 2. Comparison among major RMG exporting countries

Exporters	Amount (in billion-dollar)	Per centage of market share	Growth rate	Per-hour labor productivity (in US dollar as of 2017)	Global competitiveness index ranking 2019
China	152	30.8	-4	12.1	28
Bangladesh	34	6.8	2	3.8	105
Vietnam	31	6.2	8	5.2	67
India	17	3.5	4	8.3	68
Turkey	16	3.2	1	38.5	61
UK	9	1.8	1	55.5	9
Indonesia	9	1.7	-4	12.5	50
Cambodia	9	1.7	4	2.7	106

Source: Author's construction

removal of the Generalized System of Preferences (GSP) on the horizon (Zahir & Ali, 2020). Bangladesh focuses more on raw material sourcing and delivery cost minimization than labor productivity because of the availability of cheap labor. In comparison to Bangladesh, Vietnam holds the advantage in labor productivity, 5.2 USD per hour compared to 3.8 USD per hour in Bangladesh (Table-2), though utility supply and labor cost are lower in Bangladesh.

India is the 4th largest exporter of apparel, following Vietnam, and the largest cotton producer in the world, producing 33.7 million bales of 170 kgs each annually (IBEP, 7895). India's market share rose to 3.5 percent in 2019 from 3.3 percent in 2018. About 45 million people are directly employed by the textiles and apparel sector. Labor productivity is higher than in Bangladesh. Productivity Per Worker in India was USD 6.41 compared to USD 3.45 in Bangladesh. The government of India incentivizes garments exporters by subsidizing a portion of the cost of export borne as duties under the Merchandise Export from India Scheme (MEIS). This allows for easier market access for their exporting firms. Because of this large production volume of cotton, India is able to capitalize on not only low material prices when it comes to producing RMG products but also when exporting cotton (Zahir & Ali, 2020).

Turkey is geographically positioned to allow strategic access to the EU market, which allows it to benefit when exporting. Recently, it has come under competition from China's Belt Road initiative in this regard. Turkey also has multiple signed free trade agreements, many of which are with European countries. While this allows preferential market access and solidifies the EU as the major destination for Turkish RMG exports, Turkey is also keen to diversify its export destinations. (Zahir & Ali, 2020)

Labor and Workplace Safety-Related

After the incident of Rana Plaza in Bangladesh, poor labor and workplace practices in the garment industries have been widely recognized (Vural, 2019). Workplace safety in the Bangladesh RMG sector is below the ILO standards, while low wages and excessive overtime are common (Afrah & Rani, 2018). ILO (2020a) reports that during the Covid-19 pandemic in Bangladesh, there were no precautious measures in the workplaces to keep the workers safe from being infected.

International non-government organization Human Right Watch (2015) found a violation of worker's rights and allegations of anti-union tactics, poor workplace safety, irregular or non-payment of wages, sexual violence, workplace discrimination, and abusing child labor in Bangladesh RMG industry. Moreover, a number of workers die every year in workplace accidents, fires, and panic stampedes. (Ahmed et al., 2020) found that 90 percent of the RMG factories do not comply with all the rules and regulations mentioned in the Bangladesh Labor Law (BLA), 2006. Though the amendments to the labor law in July 2013 have made registering a union easier, labor unions exist in less than 10 percent of factories (HRW, 2015), and only 5 percent of garment workers in Bangladesh belong to a union, while 80 percent of workers are unionized in Cambodia (Paton, 2020).

Environment

The 12th UN Sustainable Development Goal aims for 'Responsible Consumption and Production', with targets referring to efficient usage of natural resources, environmentally sound chemical and waste management, increased technology integration, and information dissemination regarding these practices. For both the RMG sector and the fashion brands, the biggest concern is in the production of textiles, which is resource-intensive due to the processes of washing, dyeing, and finishing (Nagurney & Yu, 2012). Worldwide, 5 trillion liters of water are used every year solely for fabric dyeing (Shen et al., 2019). An average factory in Bangladesh uses 300 liters of water daily, and given the size of the industry, this creates significant pressure on the freshwater resources of the country (Uddin, 2019). According to BGMEA, there are 125 LEED green garment factories in

Bangladesh, and many more have registered for LEED certification. However, in the textile industry, small and medium-size factories still face the problem of effluent discharge and the use of coagulants and chemicals, causing serious adverse impacts on the environment (Uddin, 2019).

Financial vulnerability

The financial vulnerability of a supply chain includes financial crises, bankruptcies, and exchange rate risks (Sheffi, 2015). At the beginning of the Covid-19 pandemic, many global buyers reduced or canceled orders, held shipments, and requested discounts from suppliers. Several long-established retailers, including Sears, JC Penney, Brooks Brothers, and many more, have declared bankruptcy or gone into administration (ILO, 2020b). The alarming financial vulnerability of the Bangladesh RMG supply chain has been revealed as Rubana Huq, president of the BGMEA, said that Bangladesh RMG manufacturers have no protection against buyers' bankruptcy. A survey conducted by Penn State Center for Global Workers' Rights in March 2020 found that 72 percent and 91 percent of buyers had not paid for raw materials and production costs of already-produced goods, respectively (Anner, 2020). As a result, the manufacturers' cash flow was affected immediately and faced challenges to pay their workers, immediate suppliers, and other subsequent costs.

Moreover, there are challenges in obtaining a loan for RMG manufacturers as loan sanctioning is a lengthy and bureaucratic process. The application process for a loan requires up to 20 documents to submit, which is challenging for the manufacturers. The interest rate is also high, spanning from 9 percent (for larger enterprises) to 17 percent (for smaller), which are related to working capital loans provided in BDT. (IFC & ILO, 2016). According to official data, gross public debt stood at 35 percent of GDP, where a debt-to-GDP ratio of over 50-60 percent is considered alarming. The World Bank projects that public debt will top 50 percent of GDP in 2021-22 - close to dangerous territory. As a result, the exchange rate fluctuation may increase. Also, workers are likely to demand higher wages to cope with the higher cost of living. The current Inflation rate for Bangladesh is 5.6 percent which is the highest among other competing RMG manufacturing countries, and it can remain above 5.5 percent in the next five years (Figure-1), which, on the one hand, will increase financial vulnerability. On the other hand, the high and rising inflation rate will cause a rise in raw materials costs and make Bangladesh RMG less competitive in the global

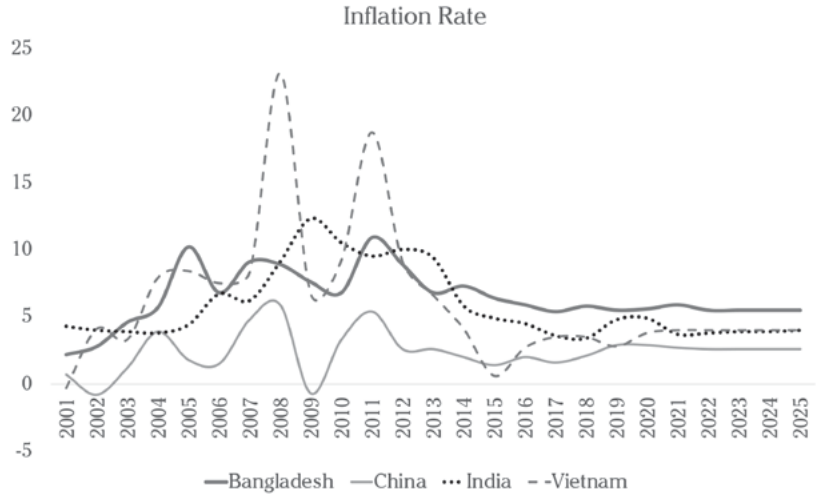

Figure 1. Inflation rate forecast up to 2025
Source: International Monetary Fund, (2020)

apparel industry.

Operational vulnerability

Consumers' demands for immediacy are increasing, and production cycles are becoming ever quicker, thus retailer demand for the shortest and leanest supply-chain cycles. Apparel brands such as H&M introduces more than 12 collections in a year, whereas Zara introduces more than 21 (Nguyen, 2020). The ultimate pressure falls on manufacturing countries like BanglThe infrastructural facilities in Bangladesh are inadequate to support its garments industry. As a result, garments industries in Bangladesh experience production and shipment delays. The average lead time for Bangladesh is 90-120 days which is (Nuruzzaman & Haque, 2009).

According to The World Bank's Logistic Performance Index, which is based on the customer clearance efficiency, the number of international shipments, transportation infrastructure, logistic competence, tracking and tracing ability, and timeliness of shipments, the overall logistics performance of Bangladesh is very poor compared to China, India, and Vietnam (Figure-2).

Bangladesh has two ports to handle international shipment, Chittagong and Mongla. Most of the shipments are made using Chittagong port as Mongla port has low water depth and lacks sufficient handling capacity and connectivity. However, facilities in Chittagong port are not adequate to handle the increasing volume of the shipment. As a result, the container keeps stuck up at the port and remains jammed, which increases lead time. Lack of deep-sea facility in Chittagong port results in a further increase in lead time as it takes time for feeders to carry containers to the regional hub ports to connect with the deep-sea services. While all the countries on the Indian subcontinent have improved their port sectors by involving the private sector following the "landlord" port model, Bangladesh is the only country that has yet to adopt it (Dappe & Suárez-Alemán, 2016).

Although technical efficiency in Chittagong Port is well (Y. C. J. Wu & Goh, 2010), the turnaround time

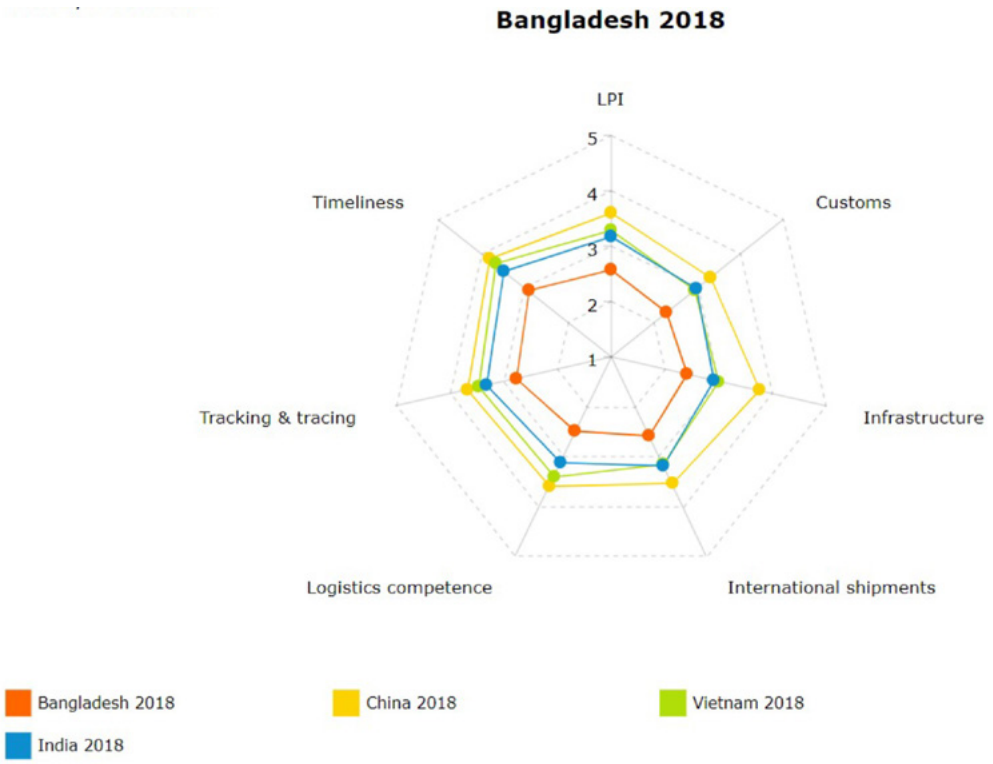

Figure 2. Logistics performance index

for containership is three times longer compared to Singapore (Herrera Dappe & Suárez-Alemán, 2016). In terms of median time spent in the port by container ships, Bangladesh ranks 150th with a median time of three days, whereas Myanmar ranks as 147th fastest port (UNCTAD, 2019). It is further aggravated by additional delay at the seaports due to political turbulence and strike by the port workers resulting in a complete shutdown of the activities of the seaports. In addition, poor inland transportation, lack of central bundle warehouse dedicated to the RMG sector, and import delay of raw materials further increase the lead time. As a result of increased lead time and delay in delivery can create a bull-whip effect and affects inventory cost (Fattahi et al., 2017)

Demand and supply vulnerability

Suppliers' disruptions

In the Bangladeshi RMG sector, SCM is more complex due to the scarcity of raw materials in the local market (Nuruzzaman, 2015). Though local textile industries are capable of supplying 80 percent of yarn and knit fabrics and 35 percent of woven fabrics for the RMG industry, the quality of the yarn and fabrics is not of international standard at a competitive price to be globally competitive. Thus, the export-oriented Bangladesh RMG sector is highly dependent on imported materials. About 70 percent of woven fabrics used in Bangladesh's garment industry are imported from China (Aung & Paul, 2020). For laces and other accessories, the RMG industry is also dependent largely on China. In FY 2018-19, Bangladesh imported textile fibers and articles worth $5.02 billion, out of its total $13.63 billion import, from China. Depending on a small number of suppliers can enhance the risk of supply chain disruption in unanticipated circumstances, as experienced with the Covid-19 pandemic when over 90 percent of manufacturers in Bangladesh reported delays in raw material shipments from China in early 2020. Data from NBR also shows a significant drop in the import of garment raw materials from China in FY 2020 compared to FY 2019 (Figure-3) due to the implementation of lockdown in China.

The backward linkage industries are also dependent on imported materials. The country produced 1.65 lakh bales of cotton in the fiscal year 2018-19, which is less than 3 percent of the annual demand for 10 million bales. Bangladesh Textile Manufacturer Association (BTMA) data of 2018 showed that Bangladesh imported 8.2 million bales of cotton, worth $3 billion, largely from India, Africa, the US, and Australia. However, cotton comes from the

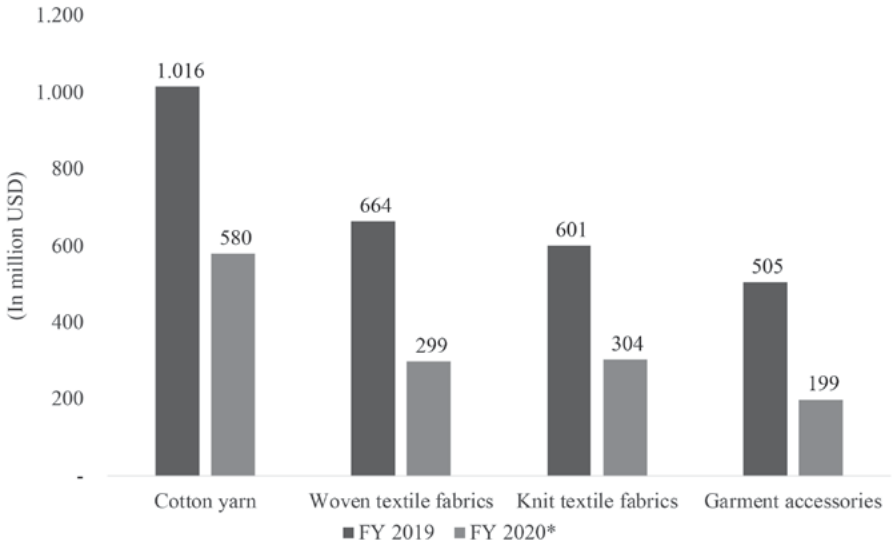

Figure 3. Garment raw material imported from China
Source: NBR

US (about 11 percent) requires a special process, called fumigation, to eliminate specific cotton germ using chemicals, test as per rules takes at least five days to complete the whole process which entails additional costs which, increases lead time and local production cost which eventually makes local supply less competitive (Siddiqui, 2020).

Undiversified Market and Unpredictable demand

Bangladesh RMG sector is mostly dependent on Europe and the USA market, so any changes in buying-policy will hamper Bangladesh RMG supply chain. The EU markets account for 62 per cent of all apparel exports from Bangladesh (Table-3). RMG industry faces a high level of demand uncertainty because of the fast-changing consumer tastes and other unpredictable market volatilities. The trend to minimize operating costs companies forwent flexibility in order to achieve a lean SC can create problems of either overstocking or understocking in dynamic market situations (Choi, 2007). Moreover, shipment variability can seriously affect customer demand and profitability as the garments industry's inability to meet the demand correctly leads to lost sales, eroded reputation, and decreased goodwill.

Table 3. Bangladesh's RMG export to the world (in per cent)

Country/ Bloc	2017-18	2018-19	2019-20	Average
EU	64	62	61	62
USA	17	18	18	18
Canada	3	3	3	3
Non-traditional	15	17	17	16

Source: Export Promotion Bureau

MANAGERIAL IMPLICATIONS

Supply chain does not operate in isolation. Thus, the vulnerability associated with the supply chain cannot be removed but reduced. When thinking about minimizing the disruption vulnerability, executives need to focus on enhancing both security (thus reducing the likelihood of disruption) and resilience (thus building capabilities for quick recovery) (Sheffi, 2005). Increasing security for the Bangladesh RMG supply chain is based on the establishment of a strong backward linkage industry, reducing lead-time by effective management strategy and infrastructure development, product, and market diversification, building earthquake-resistant infrastructure, establishing proper fire-safety measures. The most preferred resilience strategies to mitigate the vulnerabilities are backup capacity, building and maintaining strong relationships with buyers and suppliers, supplier redundancy, quality control, skill and efficiency development, adoption of information technology, increasing visibility, demand forecasting using big data analytics, responsiveness to customers, collaboration with government agencies, trading partners, and even competitors (M. M. H. Chowdhury & Quaddus, 2015). Bangladesh can adopt the landlord model to develop its port infrastructure to reduce lead time, thus being more responsive to volatile demand. There are many dissatisfaction issues among workers that lead to labor unrest in this sector which can be reduced by taking appropriate action (Roy, 2020).

CONCLUSION

Disruption risk is the most influential risk in the RMG industry. Natural disasters Structural weakness of factory building, lack of fire-safety measures, frequent labor unrest, intensified competition, non-compliance with social and environmental factors, high dependency on imported materials and lack of backward linkage industry, loss of reputation, lack of product and market diversification make Bangladesh RMG supply chain vulnerable to disruption. Moreover, the high inflation rate, fluctuation of raw price, and absence of protection against buyers' bankruptcy intensify the financial vulnerability. As the apparel and garments industry is considered a time-sensitive industry, transportation is crucial to meet buyers' demands. Fail to do so can lead to significant disruptions. ■

REFERENCES

Accord. (2020, October). *The Bangladesh Accord on Fire and Building Safety in Bangladesh*. https://bangladeshaccord.org/updates/2020/12/14/safety-remediation-progress

Afrah, S. H., & Rani, M. (2018). The Importance of CSR Practices in Business: A Case Study of RMG Sector in Bangladesh. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3026148

Ahmed, T., Mia, R., Navid Tanjim, M., Azhar Waqar, M., Mahamudul Hasan, M., Das, A., Mojnun Shamim, A., & Jahan, K. (2020). An extensive analysis of the health hazards for RMG workers in apparel sector of Bangladesh. *Journal of Textile Engineering & Fashion Technology* , *6*(04), 141–146. https://doi.org/10.15406/jteft.2020.06.00242

Ali, S. M., Arafin, A., Moktadir, M. A., Rahman, T., & Zahan, N. (2018). Barriers to Reverse Logistics in the Computer Supply Chain Using Interpretive Structural Model. *Global Journal of Flexible Systems Management*, *19*(1), 53–68. https://doi.org/10.1007/s40171-017-0176-2

Anner, M. (2020). Abandoned? The Impact of Covid-19 on Workers and Businesses at the Bottom of Global Garment Supply Chains. In *PennSate Center for Global Rights (CGWR)*.

Ansary, M. A., & Barua, U. (2015). Workplace safety compliance of RMG industry in Bangladesh: Structural assessment of RMG factory buildings. In *International Journal of Disaster Risk Reduction*. https://doi.org/10.1016/j.ijdrr.2015.09.008

APICS. (2016). Supply chain Risk and Reward: Measuring risk in your Supply Chain. In *APICS Insights and Innovations*.

Aung, T. T., & Paul, R. (2020, February 28). Asia's garment industry sees lay-offs, factories closing due to coronavirus | Reuters. *Reuters*. https://www.reuters.com/article/china-health-textiles/asias-garment-industry-sees-lay-offs-factories-closing-due-to-coronavirus-idUSL3N2AS1OE

Bangladesh Institute of Labour Studies (BILS). (2020). *265 labour movements in RMG sector in 2020*. https://tbsnews.net/bangladesh/265-labour-movements-rmg-sector-2020-183178

Blackhurst, J., Dunn, K. S., & Craighead, C. W. (2011). An empirically derived framework of global supply resiliency. *Journal of Business Logistics*, *32*(4). https://doi.org/10.1111/j.0000-0000.2011.01032.x

Blackhurst, J. V., Scheibe, K. P., & Johnson, D. J. (2008). Supplier risk assessment and monitoring for the automotive industry. *International Journal of Physical Distribution and Logistics Management*. https://doi.org/10.1108/09600030810861215

Blos, M. F., Watanabe, K., Quaddus, M., & Wee, H. M. (2009). Supply chain risk management (SCRM): A case study on the automotive and electronic industries in Brazil. *Supply Chain Management: An International Journal*, *14*(4), 247–252. https://doi.org/10.1108/13598540910970072

Bozarth, C., Handfield, R., & Das, A. (1998). Stages of global sourcing strategy evolution: An exploratory study. *Journal of Operations Management*. https://doi.org/10.1016/s0272-6963(97)00040-5

Cavinato, J. L. (2004). Supply chain logistics risks: From the back room to the board room. *International Journal of Physical Distribution & Logistics Management*. https://doi.org/10.1108/09600030410545427

CEBR. (2020). *World Economic League Table 2020 - CEBR*. https://cebr.com/reports/world-economic-league-table-2020/

Choi, T.-M. (2006). Quick response in fashion supply chains with dual information updating. *Journal of Industrial & Management Optimization*. https://doi.org/10.3934/jimo.2006.2.255

Choi, T. M. (2007). Pre-season stocking and pricing decisions for fashion retailers with multiple information updating. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2006.05.009

Choudhury, S., & Rahman, M. H. (2017). Labor Unrest in the Readymade Garment Industry of Bangladesh : Causes and Consequences. *European Scientific Journal, ESJ*. https://doi.org/10.19044/esj.2017.v13n34p87

Chowdhury, M. M. H., & Quaddus, M. A. (2015). A multiple objective optimization based QFD approach for efficient resilient strategies to mitigate supply chain vulnerabilities: The case of garment industry of Bangladesh. *Omega (United Kingdom)*, *57*, 5–21. https://doi.org/10.1016/j.omega.2015.05.016

Chowdhury, N. A., Ali, S. M., Mahtab, Z., Rahman, T., Kabir, G., & Paul, S. K. (2019). A structural model for investigating the driving and dependence power of supply chain risks in the readymade garment industry. *Journal of Retailing and Consumer Services*, *51*, 102–113. https://doi.org/10.1016/j.jretconser.2019.05.024

Christopher, M., & Peck, H. (2004). Building the Resilient Supply Chain. *The International Journal of Logistics Management*. https://doi.org/10.1108/09574090410700275

Colicchia, C., Dallari, F., & Melacini, M. (2010). Increasing supply chain resilience in a global sourcing context. *Production Planning and Control*, *21*(7), 680–694. https://doi.org/10.1080/09537280903551969

Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J., & Handfield, R. B. (2007). The Severity of Supply Chain Disruptions: Design Characteristics and Mitigation Capabilities. *Decision Sciences*, *38*(1), 131–156. https://doi.org/10.1111/j.1540-5915.2007.00151.x

Dappe, M. H., & Suárez-Alemán, A. (2016). *Competitiveness of South Asia's Container Ports: A Comprehensive Assessment of Performance, Drivers, and Costs | The World Bank*. https://doi.org/http://dx.doi.org/10.1596/978-1-4648-0892-0

Das, T., Barua, U., & Ansary, M. A. (2018). Factors Affecting Vulnerability of Ready-Made Garment Factory Buildings in Bangladesh: An Assessment Under Vertical and Earthquake Loads. *International Journal of Disaster Risk Science*, *9*(2), 207–223. https://doi.org/10.1007/s13753-018-0177-6

Dicken, P. (2015). "Capturing value" within global production networks. In *Global Shift: Mapping the Changing Contours of the World Economy*.

Dickerson, K. G. (1995). *Textiles and apparel in the global economy*.

Fattahi, M., Govindan, K., & Keyvanshokooh, E. (2017). Responsive and resilient supply chain network design under operational and disruption risks with delivery lead-time sensitive customers. *Transportation Research Part E: Logistics and Transportation Review*, *101*, 176–200. https://doi.org/10.1016/j.tre.2017.02.004

Gaudenzi, B., & Borghesi, A. (2006). Managing risks in the supply chain using the AHP method. *The International Journal of Logistics Management*, *17*(1), 114–136. https://doi.org/10.1108/09574090610663464

Gereffi, G., & Luo, X. (2015). Risks and Opportunities of Participation in Global Value Chains. *Journal of Banking and Financial Economics*. https://doi.org/10.7172/2353-6845.jbfe.2015.2.4

Haider, M. Z. (2007). Competitiveness of the Bangladesh Ready-made Garment Industry in Major International Markets. *Asia-Pacific Trade and Investment Review*.

Hallikas, J., Puumalainen, K., Vesterinen, T., & Virolainen, V. M. (2005). Risk-based classification of supplier relationships. *Journal of Purchasing and Supply Management*. https://doi.org/10.1016/j.pursup.2005.10.005

Handfield, R., Sun, H., & Rothenberg, L. (2020). Assessing supply chain risk for apparel production in low cost countries using newsfeed analysis. In *Supply Chain Management* (Vol. 25, Issue 6, pp. 803–821). https://doi.org/10.1108/SCM-11-2019-0423

Hao, H. (2015). Analysis of seismic pounding between adjacent buildings. *Australian Journal of Structural Engineering*. https://doi.org/10.1080/13287982.2015.1092684

Hendricks, K. B., & Singhal, V. R. (2003). The effect of supply chain glitches on shareholder wealth. *Journal of Operations Management*. https://doi.org/10.1016/j.jom.2003.02.003

Hendricks, K. B., & Singhal, V. R. (2005). An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm. *Production and Operations Management*. https://doi.org/10.1111/j.1937-5956.2005.tb00008.x

Herrera Dappe, M., & Suárez-Alemán, A. (2016). Competitiveness of South Asia's Container Ports: A Comprehensive Assessment of Performance, Drivers, and Costs. In *Competitiveness of South Asia's Container Ports: A Comprehensive Assessment of Performance, Drivers, and Costs*. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-0892-0

Hibbard, J. D., Kumar, N., & Stern, L. W. (2001). Examining the impact of destructive acts in marketing channel relationships. *Journal of Marketing Research*. https://doi.org/10.1509/jmkr.38.1.45.18831

HRW. (2015). *Workers' Rights in Bangladesh's Garment Factories*. Human Right Watch. https://www.hrw.org/report/2015/04/22/whoever-raises-their-head-suffers-most/workers-rights-bangladeshs-garment

IBEP. (n.d.). *Garments Industry In India: Latest data on Indian Apparel Exports | IBEF*. Retrieved January 3, 2021, from https://www.ibef.org/exports/apparel-industry-india.aspx

IFC, & ILO. (2016). *Remediation Financing in Bangladesh's Ready Made Garment Sector*. www.ifc.org

ILO. (2020a). *A What next for Asian garment production after Covid-19? What next for Asian garment production after Covid-19?* www.ilo.org/publns.

ILO. (2020b). *ILO brief - The supply chain ripple effect: How Covid-19 is affecting garment workers and factories in Asia and the Pacific*.

International Monetary Fund. (2020). *World Economic Outlook (October 2020) - Real GDP growth*. https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/BGD/CHN/IND/VNM

Islam, A. M., & Deegan, C. (2008). Motivations for an organisation within a developing country to report social responsibility information: Evidence from Bangladesh. *Accounting, Auditing and Accountability Journal*. https://doi.org/10.1108/09513570810893272

Islam, M., Bagum, M., & Rashed, C. (2012). Operational Disturbances and Their Impact on the Manufacturing Business- An Empirical Study in the RMG Sector of Bangladesh. *International Journal of Research in Management & Technology*, *2*(2), 184–191. http://iracst.org/ijrmt/papers/Vol2no22012/10vol2no2.pdf

Islam, M. S., & Liang, M. G. Q. (2012). Supply chain management on Apparel order process: A case study in Bangladesh garment industry. *Asian Journal of Business and Management Sciences*, *2*(8), 60–72.

Ivanov, D., & Dolgui, A. (2019). Low-Certainty-Need (LCN) supply chains: a new perspective in managing disruption risks and resilience. In *International Journal of Production Research*. https://doi.org/10.1080/00207543.2018.1521025

Jacobs, B. W., & Singhal, V. R. (2017). The effect of the Rana Plaza disaster on shareholder wealth of retailers: Implications for sourcing strategies and supply chain governance. *Journal of Operations Management*, *49–51*, 52–66. https://doi.org/10.1016/j.jom.2017.01.002

Jüttner, U., & Maklan, S. (2011). Supply chain resilience in the global financial crisis: An empirical study. *Supply Chain Management*. https://doi.org/10.1108/13598541111139062

Jüttner, U., Peck, H., & Christopher, M. (2003). Supply chain risk management: outlining an agenda for future research. *International Journal of Logistics Research and Applications*. https://doi.org/10.1080/1367556031000162701 6

Kader, S., & Md Khairul Akter, M. (2014). Analysis of the factors affecting the lead time for export of readymade apparels from bangladesh; proposals for strategic reduction of lead time. In *European Scientific Journal*.

Kleindorfer, P. R., & Saad, G. H. (2005). Managing disruption risks in supply chains. *Production and Operations Management*. https://doi.org/10.1111/j.1937-5956.2005.tb00009.x

Ko, M. Der, Tu, M., & Ho, T. C. (2017). Supply chain inventory model considering transportation risk and cost. *2017 4th International Conference on Industrial Engineering and Applications, ICIEA 2017*, 126–130. https://doi.org/10.1109/IEA.2017.7939192

Lomas, M. (n.d.). *Which Asian Country Will Replace China as the 'World's Factory'? – The Diplomat*. Retrieved January 2, 2021, from https://thediplomat.com/2017/02/which-asian-country-will-replace-china-as-the-worlds-factory/

Lu, S. (2019). *Regional Comprehensive Economic Partnership (RCEP): Impact on the Integration of Textile and Apparel Supply Chain in the Asia-Pacific Region* (pp. 21–41). Springer, Singapore. https://doi.org/10.1007/978-981-13-2294-5_2

Manik, J. A., & Yardley, J. (2013). Building Collapse in Bangladesh Kills Scores of Garment Workers. *The New York Times (Apr. 24, 2013)*, 1–3.

Morshadul Hasan, M. (2017). Deadly Incidents in Bangladeshi Apparel Industry and Illustrating the Causes and Effects of These Incidents. *Journal of Finance and Accounting*, *5*(5), 193. https://doi.org/10.11648/j.jfa.20170505.13

Nagurney, A., & Yu, M. (2012). Sustainable fashion supply chain management under oligopolistic competition and brand differentiation. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2011.02.015

Nguyen, T. (2020, February 3). *Fashion Nova, H&M, Zara: Why we can't stop buying fast fashion - Vox*. Vox. https://www.vox.com/the-goods/2020/2/3/21080364/fast-fashion-h-and-m-zara

Nurruzaman, N., Haque, A., & Azad, R. (2016). Is Bangladeshi RMG Sector Fit in the Global Apparel Business? Analyses the Supply Chain Management. *The South East Asian Journal of Management*. https://doi.org/10.21002/seam.v4i1.5631

Nuruzzaman, & Haque, A. (2009). Lead time management in the garment sector of Bangladesh: An avenues for survival and growth. *European Journal of Scientific Research*, *33*(4), 617–629.

Nuruzzaman, M. (2015). Improving competitiveness in manufacturing-wholesaling-retailing supply chains. *Advances in Business Marketing and Purchasing*. https://doi.org/10.1108/S1069-096420150000022016

Park-Poaps, H., Bari, M. S., & Sarker, Z. W. (2020). Bangladeshi clothing manufacturers' technology adoption in the global free trade environment. *Journal of Fashion Marketing and Management*. https://doi.org/10.1108/JFMM-06-2020-0119

Paton, E. (2020, May 8). *Garment Workers in Unions Fear For Their Jobs - The New York Times*. The New York Times. https://www.nytimes.com/2020/05/08/fashion/coronavirus-garment-workers-asia-unions.html

Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *The International Journal of Logistics Management*, *20*(1), 124–143. https://doi.org/10.1108/09574090910954873

Quadir, S. (2019, September 3). No Title. *Reuters*, European fashion brands agree new deal in Banglade. https://fr.reuters.com/article/uk-bangladesh-garments-accord-idUKKCN1VO21W

Rahman, M. (2020). *RCEP Agreement: Why it should concern Bangladesh?* The Daily Star. https://www.thedailystar.net/business/news/rcep-agreement-why-it-should-concern-bangladesh-1995081

Rahman, M., Bhattacharya, D., & Moazzem, K. G. (2008). *Bangladesh Apparel Sector in Post MFA Era: A Study on the Ongoing Restructuring Process*.

Rahman, M. T., Habibullah, M., & Masum, M. A.-A.-. (2017). Readymade Garment Industry in Bangladesh: Growth, Contribution and Challenges. *IOSR Journal of Economics and Finance*, *08*(03), 01–07. https://doi.org/10.9790/5933-0803010107

RMG workers demo for 3rd consecutive day in Gazipur | Dhaka Tribune. (n.d.). Retrieved January 1, 2021, from https://www.dhakatribune.com/bangladesh/2020/12/26/rmg-workers-demo-for-3rd-consecutive-day-in-gazipur

Roehrich, J. K., Grosvold, J., & Hoejmose, S. U. (2014). Reputational risks and sustainable supply chain management: Decision making under bounded rationality. *International Journal of Operations and Production Management*, *34*(5), 695–719. https://doi.org/10.1108/IJOPM-10-2012-0449

Roy, R. (2020). Determinants of labor unrest in the Bangladesh readymade garments industry. *International Journal of Advanced Engineering Research and Science*, *7*(5), 22–29. https://doi.org/10.22161/ijaers.75.4

Saxena, S. B. (2014). *Made in Bangladesh, Cambodia, and Sri Lanka: The Labor Behind the Global Garments and Textiles Industries*. New York: Cambria Press. https://www.cambriapress.com/cambriapress.cfm?template=4&bid=597

Schmitt, A. J., Sun, S. A., Snyder, L. V., & Shen, Z. J. M. (2015). Centralization versus decentralization: Risk pooling, risk diversification, and supply chain disruptions. *Omega (United Kingdom)*. https://doi.org/10.1016/j.omega.2014.06.002

Sheffi, Y. (2001). Supply Chain Management under the Threat of International Terrorism. *The International Journal of Logistics Management*, *12*(2), 1–11. https://doi.org/10.1108/09574090110806262

Sheffi, Y. (2005). *The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage*. The MIT Press.

Sheffi, Y. (2015). *The power of resilience : how the best companies manage the unexpected*. The MIT Press.

Sheffi, Y., & Rice, J. B. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review*, *47*(1).

Shen, B., Gu, Q., & Yang, Y. (2019). *Springer Series in Fashion Business Fashion Supply Chain Management in Asia: Concepts, Models, and Cases*. http://www.springer.com/series/15202

Siddiqui, M. (2020). Cotton import from US: Revoking the provision of double fumigation. *The Financial Express*. https://www.thefinancialexpress.com.bd/views/views/cotton-import-from-us-revoking-the-provision-of-double-fumigation-1579446165

Stanczyk, A., Foerstl, K., Busse, C., & Blome, C. (2015). Global sourcing decision-making processes: Politics, intuition, and procedural rationality. *Journal of Business Logistics*. https://doi.org/10.1111/jbl.12090

Steckler, M. S., Mondal, D. R., Akhter, S. H., Seeber, L., Feng, L., Gale, J., Hill, E. M., & Howe, M. (2016). Locked and loading megathrust linked to active subduction beneath the Indo-Burman Ranges. *Nature Geoscience*, *9*(8), 615–618. https://doi.org/10.1038/ngeo2760

Svensson, G. (2000). A conceptual framework for the analysis of vulnerability in supply chains. *International Journal of Physical Distribution & Logistics Management*. https://doi.org/10.1108/09600030010351444

Svensson, G. (2004). Vulnerability in business relationships: The gap between dependence and trust. In *Journal of Business and Industrial Marketing*. https://doi.org/10.1108/08858620410564418

Tang, C., & Tomlin, B. (2008). The power of flexibility for mitigating supply chain risks. *International Journal of Production Economics*, *116*(1), 12–27. https://doi.org/10.1016/j.ijpe.2008.07.008

The World Bank. (2018). *Country Score Card: Bangladesh 2018 | Logistics Performance Index*. https://lpi.worldbank.org/international/scorecard/radar/254/C/BGD/2018/C/CHN/2018/C/VNM/2018/C/IND/2018

Uddin, M. (2019). *Reducing the environmental impact of RMG industry | Daily Star*. https://www.thedailystar.net/opinion/environment/news/reducing-the-environmental-impact-rmg-industry-1738618

UNCTAD. (2019). *Review of Maritime Transport 2019 - Chapter 3*. https://unctad.org/system/files/official-document/rmt2019ch3_en.pdf

Vural, C. A. (2019). *Sustainability Issues in Asian Fashion Supply Chains: Retailers Versus Suppliers*. https://doi.org/10.1007/978-981-13-2294-5_3

Wadud, Z., & Huda, F. Y. (2017). Fire Safety in the Readymade Garment Sector in Bangladesh: Structural Inadequacy Versus Management Deficiency. *Fire Technology*, *53*(2), 793–814. https://doi.org/10.1007/s10694-016-0599-x

Wagner, S. M., & Bode, C. (2006). An empirical investigation into supply chain vulnerability. *Journal of Purchasing and Supply Management*. https://doi.org/10.1016/j.pursup.2007.01.004

World Bank. (2018). *Bangladesh Disaster Risk and Climate Resilience Program - Bangladesh | ReliefWeb*. https://reliefweb.int/report/bangladesh/bangladesh-disaster-risk-and-climate-resilience-program

World Economic Forum. (2019). *The Global Competitiveness Report*.

WTO. (2018). World Trade Report. In *World Trade Organization*.

WTO. (2020). World Trade Statistical Review 2020. *World Trade Organization*.

Wu, T., Blackhurst, J., & Chidambaram, V. (2006). A model for inbound supply risk analysis. *Computers in Industry*. https://doi.org/10.1016/j.compind.2005.11.001

Wu, Y. C. J., & Goh, M. (2010). Container port efficiency in emerging and more advanced markets. *Transportation Research Part E: Logistics and Transportation Review*, *46*(6), 1030–1042. https://doi.org/10.1016/j.tre.2010.01.002

Yan, B., Jin, Z., Liu, Y., & Yang, J. (2018). Decision on risk-averse dual-channel supply chain under demand disruption. *Communications in Nonlinear Science and Numerical Simulation*, *55*, 206–224. https://doi.org/10.1016/j.cnsns.2017.07.003

Zahir, S., & Ali, S. (2020, August 31). *Assessing Bangladesh RMG's International Competitiveness*. https://www.lightcastlebd.com/insights/2020/08/31/the-fashion-war-that-matters-assessing-bangladesh-rmgs-international-competitiveness