

An overview of green supply chain management practices in Bangladesh construction industries

Mohammed A. I. Chowdhury^a, Arvind Upadhyay^b, Briggs Austin^c, Mostain

Belal^d

^{a, d} Cardiff Metropolitan University, United Kingdom

^b University of Brighton, United Kingdom

^c London School of Commerce, United Kingdom

Corresponding author: a.upadhyay@brighton.ac.uk

Abstract

The contemporary trends of Green supply chain management (GSCM) are making awareness in the construction industries. GSCM is working as a catalyst to gain competitive advantage and sustainability; with environmental consciousness and globalization. This paper is based on literature review of GSCM practices in Bangladesh construction industries.

Keywords: Construction industry, Green Supply chain management, Sustainability

INTRODUCTION

Due to continuous globalization and innovative changes the organizations are inevitably required to response quickly to the fast-changing competitive environment (Conti, 2013). According to Hervani et al. (2005) and Srivastava (2007), GSCM practices are considered as material management, green purchasing, green manufacturing, green design, reverse logistics and green distribution/marketing that refer to the environmental integration of supply chain management with consumers end-of-life management.

GSCM has also been conceptualized through the theory of remanufacturing, reuse and recycling, which includes green design, total quality, environmental management, green packaging, green procurement, eco-friendly transportation, and product end-of-life practices (Hervani et al., 2005). Green purchasing, green design, reverse logistics, green manufacturing, investment return, and internal environmental management are the major GSCM elements (Amemba, et al., 2013; Sarkis et al., 2011; Zhu et al., 2008; Zhu et al., 2008; Hervani et al., 2005; Carter, 1998) which play a significant role to attain sustainable environment.

GSCM practices have been investigated in the construction industry to attain environmental sustainability emphasising on reducing solid waste (Begum et al., 2009; Ofori,2000).

Eventually, it is economically profitable, sustainable, and socially acceptable (Sarkis et al., 2011). Even though GSCM is alleviating environmental issues through economic benefit to the organizations (Eltayeb et al., 2010), the philosophy of GSCM is explored insignificantly in construction industry for reducing waste. Studies of GSCM in developed countries have been progressed significantly than those of developing countries. Despite the growing concern of environmental sustainability, there is no significant progress of GSCM practices in the chosen context, Bangladesh construction industry.

Bangladesh construction sector is booming by making a great contribution to the GDP of 10 % (UNEP, 2012). In Bangladesh, the lack of environmental practices lead environmental hazard, climate change, less energy efficiency, insufficient waste management and more carbon accumulation in the atmosphere. The application of environmental laws and regulation is rare. As GSCM has already been sought as a sustainable tool to improve the supply chain and overall business operation, this study has intended to review the relevant literature to provide a perspective of GSCM practices which can be employed in Bangladesh construction industry.

BACKGROUND OF THE STUDY

GSCM has emerged as an effective tool to ensure sustainability with a lower environmental footprint through the reduction of waste and carbon. GSCM has enhanced the focus on research application in business in different industrial sections (Srivastava, 2007; Sarkis et al., 2011; Zhu et al., 2012; Tseng et al., 2013). In traditional methods of Supply Chain Management (SCM), environmental hazards, wastage, climate change less efficiency are common phenomena in Bangladesh.

Every major supply chain activity generates some level of waste consumes energy. According to Zhu, Sarkis and Lai (2008), reduction in energy usage; waste generation issues that need to be addressed throughout the supply chain. The continuous rapid growth of the construction industry in Bangladesh has brought challenges relating to resource scarcity, energy, waste generation some adverse environmental implications (UNEP, 2012; Ofori, 2000). The contemporary literature on GSCM is very weak in Bangladesh (Shah and Muraduzaman, 2013).

Potentially, environmental issues having an impact on an overall aspect of the supply chain from plant location, technologies employed, product design, manufacturing process, packaging, energy consumption, logistics, raw material purchase, marketing, worker safety, sales, and final product disposal (Waller, 1999; Wu Dunn, 1995). According to Bowen et al. (2001), there are two types of green supply chain- greening the supply process and product based green supply. Van and Hoek (1999) state that GSCM practices include a strategic commitment to the environment, designing product, environmental commitment by the supplier, that could be disassembled, recycled or reused, adopting life cycle approach (LCA), to design manufacture of the product and process services. The supplier (Upstream) and customer focused (downstream) movement into the supply chain have getting attention to the environmental issues risks associated with an organization good service (Wise and Baumgartner, 1999).

CONSTRUCTION INDUSTRY AND GSCM

According to Waste concern agency (2012), the construction sector has been growing fast in Bangladesh, contributing employment of 2.88 million by 2014 and 3.32 million by 2020. In the construction sector employment, an annual growth rate is 7.36 %. Due to the absence of necessary Public Policy, financial constraint, technical capability gap are the common phenomena in the construction sector in Bangladesh. The GDP is 6.7 % during 1995-96 to 2008-2009 and 10 % in 2012 (UNEP, 2012). The volume of municipal solid wastes including construction waste in Dhaka, Bangladesh are generating in urban area-3,000 tons/day (Waste Concern 2005, JICA (2005)). According to REHAB (2014), there is a total of 1081 construction companies in Bangladesh.

The green practices by construction companies are not real reported by Talford (1995). Bangladesh National Building Code (BNBC) need to be revised for the effective use of green construction materials. Due to unplanned urbanization reorientation of the lifestyle excessive amount of waste in generated in Bangladesh. Bangladesh is facing solid waste dilemma due to lack of public awareness community sensitization (Kassim Ali, 2006).

In the UK, the construction sector is the largest sector of the UK economy contributing £90 billion 10% of the total UK employment (UK construction, 2013). However, the construction sector is generating the largest amount- of waste, approximately 104- 110 million tonnes /yr, per capita waste in the UK is 1538 kg /Yr whereas EU-27 per capita of waste 1638kg/Yr (Digest of Waste Resource Statistics, 2015). The UK government set a target to reduce the waste in the construction industry, for this purpose the Site Waste Management Plans (SWMP) Regulations 2008 is applying for all construction projects. However, Australia generates about 14 million tonnes /Yr, (SWMCI, 2013), US -136 million tonnes /Yr (Yuan, 2012), and Holland 4.25 thousand million tonnes /yr (Seydel et al., 1998) of construction waste.

The Construction Industry (CI) is one of the largest sector more dynamic industry using more energy, consuming raw materials than any other economic activity (Malia et al., 2013). Construction activities are not environmentally sound because of various adverse impacts as a result of noise, resource depletion, dust, discharge of toxic waste air pollution, etc. (Lu and Yuan, 2011). However, for the development of a country economy, construction industry plays a major role. It's representing 28.5% of the European Industry (EI) as well as contributing 7.0% of its economy. It's produced the bulk amount of waste creates impacts on the environments (Eurostat, Environment and Energy, 2011).

Aziz and Hafez (2013) investigated that over the past 40 years, the productivity of construction industry has been declining worldwide; to improve the situation lean construction is the best way. Lean construction helps to increase design, production, delivery as well as management. However, there are many difficulties to adopt lean concept in the construction industry (Kim and Park, 2006). Kim and Park (2006) proved that lean construction is an innovative construction management method. Lean concept practice implementation in the construction industry is profitable sustainable (Aziz and Hafez, 2013; Marhani et al., 2012; Eriksson, 2010; Tezel, 2007; Kim and Park, 2006). Ofori (2000) stated that integrated construction supply chain is the best way, to reduce waste and develop positive environmental impact. A number of organizations like the environment agency the UK government, BREEAM (Building Research Establishment Environmental Assessment Methodology), the construction industry board (CIB), Building Research Establishment (BRE) Waste concerns, Bangladesh Association of Construction Industry (BACI), the Construction Products Association (CPA), US Environmental Protection Agency (EPA) etc have stated their concerns to make sustainable of the construction sector.

GSCM AND COMPETITIVENESS

The contemporary GSCM practices by the companies are widely diffused, for environmental performance improvement and gaining competitive advantages in the business (Testa and Iraldo, 2010). In globalization, GSCM is a complimentary with other management practice. However, sustainability, social progress, competitiveness, globalization, economic-dynamism and environmental performance go hand in hand (Balkyte and Tvaronavičiene, 2010). Sustainable competitiveness is a new concept in international globalization for sustainable development and wellbeing. Lall (2001) mentioned that in developing country policy maker worry about their national competitiveness in relation to international competitiveness. This competitiveness brings the revolutionary changes in construction industry for example lean construction (Abdullah et al., 2009).

GSCM, GLOBALIZATION AND SUSTAINABILITY

The conventional green initiatives are associated with many weaknesses (Sarkis, 2006). Environmental consciousness, climate change, natural calamities ecological imbalance, general supply chain are upgraded to green supply chain to diminish the impacts and improve the environment with sustainable practices of organizations (Sarkis et al., 2011; Hervani et al., 2005). The construction impact on the environment is a major issue in Bangladesh. Construction industry produces the bulk amount of waste and practices traditional supply chain without sustainable concern (Begum et al., 2009). Due to globalization, the GSCM principal practices are playing a significant role not only in manufacturing but also in technology, can be used by the other business sectors such as government, education, and services (Khiewnavawongsa and Schmidt, 2007).

GSCM PRACTICES IN CONSTRUCTION INDUSTRIES

A construction supply chain is more complex compared to manufacturing supply chain usually consist of numerous participants complex structure (Cheng et al., 2010; Meng, 2012). SCM application practices in the construction industry the effective construction supply chain depends upon the collaboration and coordination between supply chain partners contractors (Horvath, 2001); progressively accepted supply chain collaborations as an approach (Briscoe and Dainty, 2005). Construction supply chain includes consultants, project clients, main specialist contractors, and various supplier key elements. According to Cox et al., (2006), in construction supply chain end-users contractor's relationship are considered the main relationship.

In recent years, major manufacturers around the globe have developed implemented more comprehensive supply chain to improve their environmental practices through green supply chain (Begum et al., 2009; Rao, 2002). An organisation or a company green supply chain practices by internal integrated environmental management activities and external employing market-based mechanisms (Vachon, 2007). GSM practices by the suppliers with the motivation training, arranged by the organisation for better practice. For example Pfizer, the pharmaceutical company arranged workshops training for their supplier to promote environmental practice purpose by this way the suppliers can improve (Rao, 2002). The practices of GSCM involved reduce the emission of greenhouse gasses, increasing energy efficiency, saving natural resources by reducing wastage, environmentally friendly biodegradable packaging, recycling techniques with best green procurement integrate environmental management with hybrid technology for transportation (Chaturvedi, 2010; Luthra et al., 2009; Srivastava, 2007).

GSCM practices in various ways, from purchasing to integrated lifecycle management as an upstream supply chain, manufacturers reverse logistics to the integrated downstream supply chain, closing loop with reverse logistics, suppliers to customers followed by reuse and recycling (Zhu and Sarkis, 2006). Green procurement is an upstream element of Green supply chain management that was examined by Kahannali et al., (2015) and its helps to bring social, environmental, economic and intangible benefit.

Design changes can help to reduce waste processing and recycling cost (Chen and Sheu, 2009). According to McLennan(2004), through sensitive design to eliminate hazardous environmental impact is the ultimate aim. In the design stage, the fundamental of waste hierarchy, for example, the three Rs reduce, reuse and recycle should be considered for sustainability. By applying appropriate design is possible to extract maximum benefits from the products, in that circumstances construction industry can generate the least amount of waste.

Due to global warming, the environmentalist put perseveres on manufacturing companies to practice green manufacturing (GM) (Ofori, 2000). The GM practice is not only improving the environment (Deif, 2011) but also impact on the shareholders, consumers, as well as increase the company perception in the competitive market (Zhu and Sarkis, 2004). By practice of lean (Yang, 2011) and JIT manufacturing (Inman et al., 2011) companies can achieve the sustainability in manufacturing. ISO 9000 and ISO 14000 code of practice lead to environmental sustaibility (Marimon et al., 2009). Six Sigma is an useful methodology to reduce waste and effecive in every step of manufacturing and production process (Timans et al., 2012).

Investment recovery (IR) practice is revealed that it brings both social, economic and environmental benefit. Prahinski and Kocabasoglu (2006) state that at least 70% profit generated by IR, eventually IR is a true driver of the organization.

Practicing ISO 14001 certification by companies it improves not only environmental performance but also business growth; fulfill the international requirements, promote the marketplace business competitiveness as well (Rao, 2005; Zhu and Sarkis, 2006).

Product life cycle assessment is the important thing for GSCM. In this case material impact, design, data inventory, improvement, product process, analysis, need to carefully consideration for life cycle assessment (Hervani et al., 2005).

For strategic GSCM practice the planning, operation levels of business organization are distinguished as a strategic, tactical operation level. GSCM practices are internal environmental management, cooperation with supplier customers, to motivate green purchasing for marinating environmental requirements, investment recovery and eco-design (Zhu and Sarkis, 2006). Internal environmental management practices in the organization are a critical element of the implementation of innovation (Kumar and Chandrakar, 2012). Zhu and Sarkis (2004) mentioned that IEM encompass senior manager commitments, mid-level manager's support, cross-functional assistance, total quality management, environmental compliance auditing program, and ISO 14001 Certification.

Bangladesh is a developing country,however there are very few GSCM practices in the construction industry due to lack of legislation implementation, insufficient knowledge of

Table 1: GSCM elements practice and environmental performance

Authors	GSCM practices	Country Focus		Industry	Indication of construction Factors
		Developed Country	Developing Country		
Wan Mahmood et al., 2013	GP ED RL GP	Malaysia	-	Manufacturing companies	NA
Vijayvargy and Agarwal, 2014	GP ED RL GP		India	Organization	NA
Holt and Ghobadian, 2009	IEM	UK		Manufacturing companies	NA
Zhu et al., 2013	IEM GP ED CWC IR GM	China		Manufacturing companies	NA
Jr et al., 2012	CWC ED RL IR	USA		Manufacturing companies	NA
Ortiz et al., 2009	GP GD GM		Colombia	Construction industry	Building life cycle; Building materials

(Here, Green purchasing (GP); Eco design (ED); Reverse logistics (RL), Green manufacturing (GM); internal environmental management (IEM), Investment recovery (IR); Co-operation with customers (CWC), Green Distribution (GD))

environmental sustainability, poor management, lack of coordination and cooperation, lack of customer, manufacturer and supplier awareness. Developing countries like India, Thailand, and Indonesia have been practicing GSCM situation better than Bangladesh. Developed countries like Switzerland, USA, UK, Canada, Australia, Malaysia, China etc. have established GSCM practices in the construction industries. GSCM elements practices are shown in Table 1. GSCM practice is inevitable, finally this table (1) indicates research gap in construction industry.

ENVIRONMENTAL PERFORMANCE INDEX (GPI)

EPI measures the environmental performance of national protection endeavour in 178 countries. Bangladesh is a developing country. According to EPI (2014), Bangladesh overall EPI ranks 169 (Score-25.61) out of 178 countries. Whereas, in 2012, her ranks at 115 out of 132 countries; based on 22 performance indicators. In that report there is no data on climate and energy of Bangladesh. It's indicating that very poor green practices. EPI ranks evaluation indicates that Bangladesh performance is very weak. Based on EPI (2014) reports, the highest and lowest ranks were occupied by Switzerland (overall score-87.67) and Somalia (overall score 15.47) respectively.

CONCLUSION

This research study based on literature review of GSCM practices in the construction industries that are highlights for the cost effective and easy to implement to achieve environmental sustainability. The adoption of GSCM practices in Bangladesh construction industry has a lot of barriers (i.e. lack of awareness) and most of the companies not responding positively. The overall green practices in Bangladesh below the satisfactory level based on EPI (2014) ranks. However, contemporary green initiative taken by the Government will lead to future practice of green SCM. This is the first research study of GSCM practices in Bangladesh construction industry. This study is the benchmark of further research to find out relationship between GSCM practices and construction industry for improving sustainability.

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