An empirical analysis of green supply chain management practices in Bangladesh construction industry

Mohammed A I Chowdhury
Ph.D. candidate at Cardiff Metropolitan University, Department of Cardiff school of management, United Kingdom

Arvind Upadhyay (a.upadhyay@brighton.ac.uk)
Senior Lecturer, Brighton Business School, University of Brighton, United Kingdom

Austin Briggs
Senior Lecturer, London School of Commerce, London, United Kingdom, United Kingdom

Md Mostain Belal
Ph.D. candidate at Cardiff Metropolitan University, Department of Cardiff school of management, United Kingdom

Abstract

The contemporary environmental issues are alleviating through green supply chain management (GSCM) practices in the construction industry; bring economic benefit and sustainability for the business organization. Construction industry operations are very complex and integrated supply chain i.e. GSCM practice is the best way to reduce construction waste and improving environmental performance. The application of GSCM in the construction industry in Bangladesh is still unexplored, and this study explored the relationship between GSCM and construction waste to reduce construction waste through multiple-regression. Quantitative data has been collected by semi-structured survey questionnaire from 30 the construction industries in Bangladesh.

Keywords: Green supply chain management practices, Construction industry, Survey-questionnaire

Introduction

The practices of green supply chain management (GSCM) have increased under the condition of new regulations for greening the business operation. GSCM adoption by a lot of service and manufacturing industry due to globalization and considering various factors such as response to diverse environmental legislation and regulation, brand image, work innovation, climate change, cost reduction, reduction of green house gas emissions, solid waste reduction, water conservation, global warming, and reduction of pollutions like water, noise, air etc. (Chun et al., 2015; Kumar & Vashistha, 2013; Yuan, 2012; Begum et al., 2009; Zhu et al., 2008; Rao & Hault, 2005). In-spite of necessity of GSCM practices, the entrepreneur are complaining of the difficulty in

practice due to technology, response time, investment cost, numerous reporting, communication, lack of skill manpower and understanding of the issues relating to the environment (Chun et al., 2015 ; Hervani et al., 2005; Ofori**,** 2000**).** GSCM practices include: material management; green purchasing; green manufacturing; reverse logistics; green design, investment recovery, internal environemntal management, green distribution/marketing that refer to the environmental involvement, and the integration of supply chain management with consumer's end-of-life management (Zhu et al., 2008; Srivastava, 2007; Hervani et al., 2005).

While GSCM is alleviating environmental issues and bringing economic benefit to organizations (Eltayeb et al., 2010), it is still little known and less practiced, especially to reduce waste in the construction sector. In a developing country, GSCM practices to reduce waste in the construction industry are not remarkable. The construction industry and its operation are very complex; producing a large volume of waste (Ortiz et al., 2009; Yuan and Shen, 2011; Lu et al, 2011; Ketikidis et al., 2013) create a great impact on the environment(Begum et al., 2009). Integrated supply chain is the best way to reduce construction waste and improving performance (Ofori, 2000; Begum et al., 2009). The application of GSCM in the construction industry in Bangladesh is still unexplored, though it's contributing 10% GDP to the Bangladesh economy (UNEP, 2012).

This research aim to investigate GSCM practices likely to be adopted by the construction industry in Bangladesh with dominated by GSCM major elements. Environmental and economic performance, sustainability has studied with the relationship between GSCM and construction industry to reduce construction solid waste. Based on research aim, the research has the following objectives: 1) to critically review the existing literature on GSCM and environmental sustainability with a view of identifying an effective waste reduction model in the construction industry. 2) to evaluate current practices of GSCM in the construction industry and 3) to investigate the inhibitors of waste management in Bangladesh's construction industry for efficient environmental sustainability. The following research questions have been considered: 1) how can GSCM be effectively applied in the construction industry in Bangladesh to reduce waste? 2) What are the current practices and contextual factors inhibiting the application of GSCM in the construction industry in Bangladesh?

Literature Review and Hypothesis development

Construction industry & waste: The construction industry (CI) is one of the largest sector in the world. The productivity of the construction industry has been declining worldwide; to improve the situation, green construction is the best way. Green construction help to improve design production, delivery as well as management (Hafez, 2013). Construction waste is arises from construction, renovation, and demolition activities (Lu et al., 2015; Kofoworola and Gheewala, 2009). In the context of Bangladesh, as a result of unplanned urbanization and reorientation of lifestyle, excessive amount of waste is generated and facing a solid waste dilemma; due to lack of public awareness, lack of enforcement of legislation, lack of technology, and community sensitization (Kassim & Ali, 2006). However, waste is an inevitable by-product of the construction industry (Begum et al., 2009). Construction wastes create serious consequences for the environment (Ofori, 2000), as well as social and economic impact (Begum et al., 2009; Begum et al., 2007; Esin & Cosgun, 2007). In the contrary, the construction sector is the largest sector of the UK economy, contributing £90 billion

and 10% of the total UK employment (UK construction, 2013). The UK construction sector is responsible for generating 33% of total waste (Defra, 2009). The UK government has set a target to reduce the waste in the construction industry. For this purpose, the Site Waste Management Plans (SWMP) Regulations of 2008 are being applied to all construction projects). In the EU, this industry generates approximately 500 million tonnes of waste per year, which is around 25% to 31% of all waste in the EU (Eurostat, Environment & Energy, 2009; Rodrigues et al., 2013). Construction is a dynamic industry that uses high energy and consumes more raw materials than any other economic activity (Malia et al., 2013). For the development of a country's economy, the construction industry plays a major role. The industry represents 28.5% of the European Industry (EI) and contributes to 7.0% of its economy. It produces the bulk amount of waste and creates an impact on the environment (Eurostat, Environment & Energy, 2011).

Theoretical foundation of GSCM practice: Recently, major manufacturers around the globe have developed and implemented more comprehensive supply chains to improve their environmental practices through green supply chain (Begum et al., 2009; Rao, 2002). GSCM is modern and innovative tool to attaian environemntal sustaiability (Murphy & Gouldson, 2000; Zhu et al., 2011; Zhu et al., 2012). Ecological modernization theory is the basis of GSCM practices and waste behavior theory underpinned the practice of waste reduction. The theory has encouraged both practitioners and researchers for policy making and technological innovation. Environmental protection inspired by study and emulating the natural eco-system by adopting different environmental practice with the consideration of institutional drivers and pressure (Jelinski, 1992; Erkman, 1997). Hence, GSCM practice is underpinned by institutional theory. Although environmental innovations such as GSCM practice are built on both EMT and institutional theories, adoption of innovations and GSCM practices largely depend on types of industries and ecological development within different contextual pressures (Zhu & Sarkis, 2006; Zhu et al., 2013; Chiou et al., 2011). This research study investigates the relationship between GSCM practice and construction waste to improve environmental performance. GSCM practice in different industry has already validated and accepted across different countries around the world (See Table 1) and considered as a new paradigm.

*Green Supply Chain (GSC) elements: Green Procurement (GP)***:** Green procurement is a kind of environmental purchasing that involves reduction, reuse, and recycling of materials in the method of purchasing (Amemba, et al., 2013; Zhu et al., 2008). GP is providing a solution to an environmentally concerned cost-effective conventional business to direct a selection of product services that consequently diminish environmental impact (Salam, 2008). GP is a key factor in providing specific design to suppliers that includes environmental requirements of procurement items, environmental objectives, suppliers ISO14001 certification, supplier internal management, and an environmental audit (Zsidisin & Hendrick, 1998; Zhu et al., 2008; Sarkis, 2012).

In the purchasing field, green procurement is an established concept. GP is to facilitate reusing, recycling, and resource reduction (Carter & Carter, 1998). The purchasing department should participate in every activity of supply chain management should more concretely purchase reused and recycled materials so as to reduce the use of resources as much as possible. In the enterprise to improve business performance, the

ultimate goal is to minimize using raw materials and treatment cost, and in this way boost the enterprise's reputation of shielding resources (Zhu & Geng, 2002). The potential aim of green procurement is to reduce waste from the business waste disposal activities with a comprehensive reduction in total cost during the process (Martha & Houston, 2010). The customer demands and priorities have a direct influence on driving green supply chain management as an environmentally managed environmental purchasing (Ellram, 1998; Walker et al., 2008; Amemba et al., 2013).

Green design (GD): Due to environmental globalization considerations, green design has been more concerned with the design of products in manufacturing industries. Fiksel (1996) has stated that during the process development of a new product, green design issues are associated with environmental health safety, product life cycle, and sustainability. GD includes various disciplines in its wide scope - occupational health safety, product safety, resource conservation, environmental risk management, pollution prevention, and waste management (Amemba et al., 2013; Srivastava, 2007). Design changes can help to reduce waste processing and recycling costs (Chen and Sheu, 2009).

Traditional design practice is replaced by green design practice, which is less problematic, sustainable, and shows an increased environmental performance. Azzone & Noci (1996) have stated that the new products of environmental performance are to be measured by the integrated approach. During product design, regulations and legislation have been considered (Bellmann & Khare, 1999, 2000; Fleischmann et al. 2000; Das, 2002), while Inderfurth Lann (2001), the arrangement with a design for remanufacturing. The choice of suitable material during design should address recycling issues (Bellmann & Khare, 2000). Life Cycle Assessment (LCA) is a method for accessing and estimating the environmental, resource occupational health allied consequences through all stages of its life, for example – raw material processing, manufacture, transportation, supply, utilization, remanufacturing, recycling, final disposal. LCA engages in tracking the energy, the material flows, and retrieving disposal (Miettinen & Hamalainen, 1997; Gungor & Gupta, 1999; Tibben-Lembke, 2002; Arena & Rosa, 2003).

*Green Manufacturing (GM):*Green Manufacturing is a kind of production process that uses input with reasonably less environmental impacts, is highly effective, that produces little or no pollution or waste (Amemba et al., 2013). Green manufacturing not only enhances the corporate image but also increases environmental efficiency. Also, it increases production efficiency, reduces raw material costs and industrial safety expenses. The major aims of green manufacturing are to reduce the environmental burden by using appropriate process, materials, and technologies. Within green operations, green manufacturing plays a very important role. However, remanufacturing is a recycling–integrated manufacturing (Hoshino et al., 1995). Recovery is a combination of remanufacturing, reuse, and recycles (Hoshino et al., 1995). Green operations have been playing a very important role in GSCM. Green operations (GO) include all features associated with product manufacture, usage, treatment, logistics, waste management, during finalizing of design (Lund, 1984).

GSCM helps improve environmental performance, diminish waste, and reduce cost with maximum savings (Rao & Holt, 2005). At present, some multinational companies are investing in research designs during product development and manufacturing that

are environmentally sustainable and economically profitable. GSCM is a contemporary issue for green operations. For example, IBM, HP, Sony, Toshiba, Dell, Motorola, Panasonic, Walmart, NEC, and Fujitsu have adopted GSCM practices in their reverse logistics (Zhu & Sarkis, 2006). Considering the importance of GSCM, most of the leading manufacturing industries will practice reverse logistics in Asia within the next couple of decades (Hu & Hsu, 2010; US-AEP, 1999).

Investment Recovery (IR): In the significance of green purchasing in GSCM, Investment Recovery (IR) is considered as a critical aspect (Zsidisin & Hendrick, 1998) by the United States and European Union. In traditional business, IR is considered as a general practice as it can diminish waste that may have been disposed of (Zhu & Sarkis, 2004). Developing countries (like in Asia) gain less attention than developed countries like USA, UK, Germany, etc. on Investment recovery due to an inappropriate recycling system of waste management policies.

Internal Environmental Management (IEM): Like other advanced management practices, GSCM is also strongly complementary, it helps to improve the environmental performance where as reduce manufacturing waste (Testa & Iraldo, 2010). The means of improving enterprise performance is expert external management (Carter et al., 1998). According to Zhu and Sarkis (2004), internal environmental management (IEM) includes senior manager commitments, mid-level manager's support, cross-functional assistance, total quality management, environmental compliance auditing program, and a ISO 14001 certification.

GSCM and Environmental Performance: While the win-win point of view have been evidenced to validate the relationship between adoption of GSCM and environmental performance (Zhu and Sarkis, 2007; Begum, et al., 2007; Zhu et al., 2013, Chun et al., 2015), especially waste based performance, a case study based analysis has contextualized that even though the statistical relationship exists between GSCM and environmental performance, the substantial and straight results are not always distinctive (Zhu et al., 2007). Table 1 shows the summary of major investigations in the GSCM elements practice and environmental performance.
Bangadesh is a developing country, however there are very few GSCM practices in the construction industry due to lack of legislation implementation, insufficent knowledgeenvironemntal sustainability, poor mangement, lack of corordination and cooperation, lack of customer, manufacturer and supplier awerness. Developing countries like India, Thailand, and Indonesia have been practiceing GSCM. Developed countries like Swizerland, USA, UK, Canada, Australia, Malayasia, Korea, China etc. have established GSCM practices in the construction industries.

Hypothesis: The research hypotheses of this study are-1. H1). Adoption of sustainable waste management practices enhances waste reduction in the construction industry of Bangladesh. 2. H1a) Green procurement practice reduces waste in the construction industry of Bangladesh. 3. H1b) Green design practice reduces waste in the construction industry of Bangladesh. 4. H1c) Green manufacturing practice reduces waste in the construction industry of Bangladesh. 5. H1d) Investment recovery practice reduces waste in the construction industry of Bangladesh. 6. H1e) Internal environmental management practice reduces waste in the construction industry of Bangladesh.

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 GD RL GP	Malaysia	-	Manufacturing companies	NA
Vijayvargy and Agarwal**,** 2014	GP GD RL GP		India	Organization	NA
Holt and Ghobadian, 2009	IEM	UK		Manufacturing companies	NA
Zhu et al., 2013	IEM GP GD CWC IR GM	China		Manufacturing companies	NA
Jr et al., 2012	CWC GD RL IR	USA		Manufacturing companies	NA
Ortiz et al., 2009	GP GD GM		Colombia	Construction industry	Building life cycle; Building materials
Chun, et al., 2015	GP GM GL IR	Korea		Construction companies	Management level decision

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

Research Methodology

For the verification of the study model and hypothesis, which was developed based on extensive secondary data; an empirical analysis was done to develop the relationship between GSCM and construction waste. With a link to previous research semi-structured questionnaires (Huang et al., 2015; Muduli & Akhilesh, 2013) has been developed and include GSCM practices, driver, barriers, construction solid waste, and performance. This research study has used the quantitative method of a semi-structured survey designed questionnaire. For data collection, semi-structured questionnaires were given to the each company Managing Director/Manager, Assistant Manager/ Project Manager, Site Manager/ Sustainability / Supply Chain Manager, Project Engineer/ Waste/ Environmental Management Manager and Project Supervisor/ Officer/Surveyor. The filled questionnaires have been collected physically and its duration over two months. This research has supported by the similar studies of Williams and Turner

(2011); Mingqiang, (2011); Zhu et al., (2008); Darnall (2006); Sroufe (2003); Rao & Holt (2005), and Chun et al., (2015).

Quantitative analysis –preparing data for statistical analysis: Quantitative survey – questionnaire data is used for testing hypothesis and statistical data analysis by multivariate techniques (Regression) to achieve research aim and objectives. This strategy, entailing the collection of numerical data as exhibiting a view of the relationship between theory research and deductive (Bryman, 2012). This approach has no bias of the researcher and emphasizes on the numerical measurement analysis of causal relationships between variables, not processes (Denzin & Lincoln, 2005). This research study collects numerical data from the construction companies of developing the country in the context of Bangladesh. The Survey method of data collection is supported by various researchers within the construction industry and other GSCM adopted industry (Huang et al., 2015; Muduli & Akhilesh, 2013; Eltayeb et al, 2011; Chiou et al., 2011, Eltayeb et al, 2009; Rao et al., 2005; Zhu & Sarkis, 2004.).

This research study has five (5) independent variables i.e. Green Procurement (GP), Green design (GD), Green Manufacturing (GM), Investment recovery (IR) and Internal environmental management (IEM) and one dependent variable (Construction industry waste). There was a set of questions with a Likert scale (1-5), and respondents ticked the point they feel was appropriate. Each construct of the independent and dependent variables are measured on a five-point Likert scale (Likert, 1932) such as for independent variables- 1) not considering; 2) Planning to consider it; 3) Considering currently; 4) Carrying out to some degree; 5) Carryinch g it out fully and dependent variables- 1) Do not know, 2) Not applicable, 3) Negligible, 4) Minor, 5) Significant. (Adopted from Zhu et al. 2008). The construction waste has been measured as tonnes (www.wrap.org.uk). The questionnaire type is self-administered and delivered by hand to each respondent and was collected later (Saunders et al., 2009).

This study has classified the practices by GSCM processes into several factors to find out if GSCM practices may differ depending on GSCM elements like- GP, GD, GM, IR, and IEM. Factor analyses have been resulted in the classification of the activities by GSCM into the total five factors (GP, GD, GM, IR, and IEM). Regression analysis will be used for estimating the relationships among variables with a variety of multivariate techniques and testing the proposed hypothesis as well.

Data source and sampling: The sample has been collected from 30 construction companies in Chittagong city of Bangladesh. Total sample of the population of the study was 150 questionnaires from the 30 (Thirty) randomly selected construction companies out of 83 (Eighty-three) companies. The randomly selected construction companies were small (employee size 0-10), medium (employee size 0-30), and large (employee size 0-50+) companies that have been affiliated with REHAB (Real Estate and Housing Association of Bangladesh) and CDA (Chittagong Development Authority). The selection of sample size 45 companies is consistent which are supported by other studies in the same field (Chun et al., 2015; Mingqiang, 2011; Zhu et al., 2008). However, many researchers have said that a 20 percent response from the respondent would be regarded as good (Easterby-Smith et al., 2008).

Conclusion

This empirical research study is expected to develop a conceptual waste reduction model by multiple regressions in the construction industry with GSCM elements practice in Bangladesh to reduce solid waste. It explores and predicts the GSCM practice in the construction industry to improve sustainability and an investigation of the relationship between GSCM practices and construction industry for environmental performance by reducing waste. This study is addressed previous researchers (Chun et al., 2015; Begum et al., 2009; Zhu & Sarkis, 2007) concern by the GSCM practices reduce construction waste and improve environmental sustainability. This is the first study in Bangladesh to explore and predict GSCM concept implementation in the construction industry to gain sustainability.

References

Amemba, C. S., Nyaboke, P.G., Anthony Osoro, A. and Mburu, N. (2013)," Elements of Green Supply Chain Management". *European Journal of Business Management*, V.5, p.12.

Arena, A. and De Rosa, C. (2003), "Life cycle assessment of energy environmental implications of the implementation of conservation technologies in school buildings in Mendoza—Argentina", Building *Environment*. Vol. 38, No.2, pp. 359–368.

Begum, R. A., Siwar, C., Pereira, J. J. and Jaafar, A. H. (2007), "Implementation of waste management and minimisation in the construction industry of Malaysia", *Resources, Conservation and Recycling*. Vol. 51, No.1, pp. 190–202.

Begum, R.A.,Siwar, C., Pereira, J. J. and Jaafar, A. H. (2009), "Attitude and behavioral factors in waste management in the construction industry of Malaysia", *Resources, Conservation and Recycling*, V.53,No.6, pp.321–328.

Bellmann, K., Khare, A. (1999), "The European response to issues in recycling car plastics", *Technovation*. Vol. 19, pp. 721–734.

Bryman, A., (2012). *Content analysis: Chapter 12. Social Research Methods*, pp.273–293.

Carter, C. R. and Carter, J. R. (1998), "Inter-organizational Determinants of Environmental Purchasing: Initial Evidence from the Consumer Products Industry", *Decision Sciences.* Vol. 29, No.3, pp. 659-684.

Chen, Y. J. and Sheu, J. B. (2009), " Environmental-regulation pricing strategies for green supply chain management", *Transportation Research Part E: Logistics and Transportation Review.* Vol. 45, No. 5, pp. 667-677.

Chiou, T.Y., Chan, H. K., Lettice, and Chung, S. H. (2011), "The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 47, No. 6, pp.822–836.

Chun, S.H., Hwang, H. J. and Byun, Y.H. (2015), "Green Supply Chain Management in the Construction Industry: Case of Korean Construction Companies. *Procedia - Social and Behavioral Sciences*, No.186, pp. 507–512.

Darnall, N. (2006), "Why Firms Mate ISO 14001 Certification", Business *and Society*. Vol. 45, No.3, pp. 354–38.

Defra, (2009). "Protecting our Water, Soil and Air Protecting our Water, Soil and Air. *Policy"*, pp.1–579.

Eltayeb, T. and Zailani, S. (2009), "Going green through green supply chain initiatives towards environmental sustainability", *Operations and Supply Chain Management*, Vol. 2, pp. 93–110.

Eltayeb, T. K., Zailani, S. and Ramayah, T. (2011), "Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes, *"Resources, Conservation and Recycling*, Vol. 55, No. 5, pp.495–506.

Eltayeb, T.K. and Zailani, S. (2010), "Investigation on the drivers of green purchasing towards environmental sustainability in the Malaysian manufacturing sector", *International Journal of Procurement Management*, Vol. 3, No. 3, pp. 316.

Erkman, S. (1997), "Industrial ecology: a historical view", *Journal of Cleaner Production* 5 (1–2): 1–10.

Esin, T. and Cosgun, N. (2007), "A study conducted to reduce construction waste generation in Turkey", *Building Environment.* Vol. 42, No. 4, pp. 1667–1674.

Eurostat, Environment, and Energy. (2009), Generation treatment of waste. Available at: http://ec.europa.eu/eurostat/, [Accessed 20 July 2015].

Fleischmann, M., Krikke, H.R., Dekker, R. and Flapper, S. D. P. (2000), "A characterisation of logistics networks for product recovery", *Mega*. Vol. 28, No.6, pp. 653-666.

Gungor, A. and Gupta, S. M. (1999), "Issues in environmentally conscious manufacturing product recovery a survey", *Computers industrial engineering*. Vol. 36, pp. 811-853.

Hervani, A., Helms, M. and Sarkis, J. (2005), "Performance measurement for green supply chain management" Array, (Ed) *: An International Journal*, Vol. 12, No.4, pp.293–297.

Hsu, C. W. and Hu, A.H. (2008), "Green supply chain management in the electronic industry", *International Journal of Environmental Science Technology*. Vol. 5, No.2, pp. 205–216.

Huang, X., Tan, B. L. and Ding, X. (2015), "An exploratory survey of green supply chain management in Chinese manufacturing small and medium-sized enterprises pressures and drivers", *Journal of Manufacturing Technology Management*, Vol, 26, No.1, pp. 80–103.

Jelinski, L.W., Graedel, T.E., Laudise, W.D., McCall, D.W., and Patel, K.N. (1992). "Industrial ecology: concepts and approaches", *In: Proceedings of the National Academy of Sciences*, 89 (February): 793–797.

Kassim, S.M. and Ali, M. (2006), "Solid waste collection by the private sector: Households' perspective-Findings from a study in Dares Salaam city, Tanzania", *Habitat International*. Vol. 30, No.4, pp. 769–780.

Ketikidis, P. H., Hayes, O.P., Lambros, L., Gunasekaran, A., and Lenny Koh, S.C. (2013), "Environmental practices and performance and their relationships among Kosovo construction companies: a framework for analysis in transition economies", *International Journal of services and operation management*, Vol.14, No 1, pp. 115–130.

Kofoworola, O. F. and Gheewala, S. H. (2009), "Estimation of construction waste generation and management in Thailand". *Waste management*,Vol. 29, No. 2, pp. 731-738.

Kuma, A. and Vashistha, P.K. (2013), "Management of Green Supply Chain: Need of Hours", International Journal of Engineering and Management Research, Vol.-3, No. 4, pp. 1-8. ISSN No.: 2250-0758.

Large, R.O. and Gimenez Thomsen, C. (2011), "Drivers of Green Supply Management Performance: Evidence from Germany", *Journal of Purchasing and Supply Management*, Vol. 17, No.3, pp.176–184.

Likert, R., (1932), "A technique for the measurement of attitudes", In R.S. Woodworth, (edn). *Archives of Psychology*, 140, New York: New York University, pp. 1-55.

Liu, S., Kasturiratne, D. and Moizer, J. (2012), A hub-and-spoke model for multi-dimensional integration of green marketing and sustainable supply chain management, *Industrial Marketing Management*, Vol.41, No. 4, pp.581–588.

Lu, W., and Yuan, H. (2011), "A framework for understanding waste management studies in construction", *Waste Management*, Vol. 31, No. 6, pp.1252–1260.

Lu, W., Chen, X., Peng, Y., and Shen, L. (2015), "Benchmarking construction waste management performance using big data", *Resources, Conservation and Recycling*, No.105, pp.49–58.

Mália, M., De Brito, J., Pinheiro, M. D. and Bravo, M. (2013) "Construction and demolition waste indicators",*Waste management and research : The journal of the International Solid Wastes and Public Cleansing Association, ISWA*. Vol.31, No.3, pp. 241–55.

Miettinen, P. and Hamalainen, R.P. (1997), "How to benefit from decision analysis in environmental life cycle assessment (LCA)", *European Journal Of Operational Research*. Vol.7, No.97, pp. 279–294.

Mingqiang, Z. Z. Z. (2011), "Green supply chain management in construction industry", *Communications in Computer and Information Science*, No. 232 CCIS (PART 2), pp.81–86.

Muduli, K., and Akhilesh B., (2013), "Empirical investigation of the barriers of Green Supply Chain Management (GSCM) implementation in Indian mining industries." *3rd International Conference on Business, Economics, Management and Behavioral Sciences (ICBEMBS'2013) April 29-30, 2013 Singapore*.

Murphy, J. and Gouldson, A., (2000). "Environmental policy and industrial innovation: integrating environment and economy through ecological modernization", *Geoforum*, 31(1), pp.33–44.

Ofori, G. (2000), "Greening the construction supply chain in Singapore", European *Journal of Purchasing and Supply Management*, Vol. 6, No.3, pp. 195-206.

Ortiz, O., Castells, F. and Sonnemann, G. (2009), "Sustainability in the construction industry: A review of recent developments based on LCA", *Construction and Building Materials*, Vol. 23, No.1, pp.28–39.

Rao, P. and Holt, D. (2005), "Green supply chains lead to competitiveness economic performance?", *International Journal of Operations and Production Management*, Vol. 25, No.9, pp. 898–916.

Rodrigues, F., Carvalho, M. T., Evangelista, L. and De Brito, J. (2013), "Physical-chemical mineralogical characterization of fine aggregates from construction demolition waste recycling plants", *Journal of Cleaner Production*. Vol.52, pp. 438–445.

Salam, M.A. (2008), "Green procurement adoption in manufacturing supply chain", Proceedings of the 9th Asia Pasific Industrial Engineering and Management Systems Conference (APIEMS2008), Indonesia, 1253-1260.

Sarkis, J. (2012), "A boundaries and flows perspective of green supply chain management", *Supply Chain Management: An International Journal*, Vol. 17, No. 2, pp. 202–216.

Srivastava, S. (2007), "Green supply-chain management: a state-of-the-art literature review", International *journal of management reviews*. Vol. 9, No.1, pp. 53-80.

Sroufe, R. (2003), "Effects of Environmental Management Systems on Environmental Management Practices Operations", *Production Operations Management*. Vol.12, pp. 416–431.

Tibben-Lembk, R. S. (2002), "Life after death: reverse logistics the product life cycle", *International Journal of Physical Distribution and Logistics Management*. Vol. 32, No.3, pp. 223–244.

UK construction. (2013), Available at: https://www.gov.uk/ government/ uploads / system/uploads/attachment_data/file/210060/bis-13-958-uk-construction-an-economic-analysis-of-sector.pdf. [Accessed 10 July 2015].

UNEP, (2012), Available at http:// www.unep.org/sustainablesocialhousing/ Case Studies_ Bangladesh/ Bangladesh_sushi.asp, (Accessed on 15/12/2015).

Walker, H., Disisto, L. and Mcbain, D. (2008), "Driver's barriers to environmental supply chain management practices: Lessons from the public-private sectors,"*Journal of Purchasing Supply Management*. Vol.14, pp. 69–85.

Williams, I.D. and Turner, D. (2011), "Waste management practices in the small-scale construction industry," In, *Proceedings of the Thirteenth International Waste Management and Landfill Symposium. S. Margherita di Pula, Cagliari, Sardinia, Italy. Thirteenth International Waste Management and Landfill Symposium*, CISA Publisher.

www.wrap.org.uk/sites/files/wrap/Reporting%20Guidance.pdf. Accessed [10.02.2016]

Yuan, H. (2012), "A model for evaluating the social performance of construction waste management", *Waste management (New York, N.Y.)*, Vol. 32, No.6, pp.1218–28.

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Journal of Operations Management*, Vol. 22, No.3, pp.265–289.

Zhu, Q., Sarkis, J. (2006). "An inter-sectoral comparison of green supply chain management in China: Drivers and practices", *Journal of Cleaner Production* **14**(5): 472–486.

Zhu, Q., Sarkis, J. and Lai, K. (2012). "Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective", *Journal of Engineering and Technology Management*, 29(1), pp.168–185.

Zhu, Q., Sarkis, J., and Lai, K. (2013), "Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices", Journal *of Purchasing and Supply Management*, Vol. 19, No. 2, pp.106–117.

Zhu, Q., Sarkis, J., Cordeiro, J., and Lai, K. (2008), "Firm-level correlates of emergent green supply chain management practices in the Chinese context", *Omega*, Vol. 36, No.4, pp. 577–591.

Zsidisin, G.A. and Hendrick, T.E. (1998), "Purchasing involvement in environmental issues: a multi-country perspective", *Industrial Management Data Systems*, Vol. 7, pp.313–320.