Supply Chain Insider

Volume 03, Issue 01
Article Received: 05-10-20
Accepted: 05-11-2020
Available Online: 15-12-2020
ISSN: 2617-7420 (Print), 2617-7420 (Online)
supplychaininsider.org

An Overview of Green Supply Chain Management Practices in Bangladesh

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Abstract:

This paper aims to improve proper guideline for the growing industries to practice Green Supply Chain Management (GSCM) throughout all the possible ways in their supply chain and contribute to Environmental Sustainability. All kind of manufacturing process around the world is getting improved and initiated expeditiously day by day due to the continuous and restless hard work by the researchers. At first, they didn't take any count on environmental safety but waking up every day with the horrifying result of Environmental pollution that leads to global warming and many others direct and indirect impacts made them look into the matter. Since then, researchers are in search of new elements and processes that will replace the existing processes which harm the environment to a greater extent and will reduce environmental pollution and industries all over the world are adopting these new technologies to reduce environmental pollution. This is what exactly Green Supply Chain Management (GSCM) is; to develop new processes throughout the whole supply chain so that environmental pollution can be reduced in the all possible ways. In Bangladesh, Green Supply Chain Management (GSCM) is not practised remarkably. In our paper, we collected data from different types of industries to analyse how and where in the supply chain they practise GSCM and made a guideline on how they can bring a change in their ways to build up a proper Green Supply Chain and contribute to environmental sustainability.

1.Introduction

The range of activities required to plan, control and execute a product's flow from material procurement to production to distribution to consumer is known as supply chain management.

It encompasses the integrated planning and execution of processes required to optimize the flow of materials, information and capital in functions that broadly include demand planning, sourcing, production, inventory management and logistics or storage and transportation.

By GSCM or Green Supply Chain Management we mean the concepts of integrating sustainable environmental process to the traditional manufacturing process. GSCM involves driving value creation throughout the supply chain organisations to reduce total environmental impact.

The primary objectives of implementing GSCM practices in firms are:

a) Reduction of Carbon Footprint
b) Reduction of Water use
c) Emission Reduction
d) Eliminate/Minimize Waste (energy, hazardous greenhouse gas/chemical emissions, and solid waste)
e) Maximize practices of re-use and recycle
f) Preservation of bio-diversity and ecological balance

With the birth of industrial revolution in the 1800s, world economy changed drastically. Over the two centuries, millions of industries and manufacturing plants were established both to meet the uprising demands of the ascending population and also for company profits. The rapid development focused the least on climate, environment, nature, bio-diversity, wildlife and ecological balances. This ultimate negligence resulted in rise of problems such as global warming ,climate changes ,depletion of water level ,contaminated water sources, high air pollution, rise of sea water level, ocean pollution, scarcity of non-renewable resources ,destruction of bio-diversity and also many other issues. These environmental changes with devastation effects on human life and civilization made people to be concerned about climate and ecology. The world leaders, policy makers and the consumers are now well aware of the conditions and practices of environmentally sustainable supply chains soared high.

Modern consumers now decides to buy products with minimum or zero emission or damage to environment. Shift in consumer behaviour, new business policies and also competitions

regarding faster adaptations of sustainable practices forced the global industries to implement GSCM in their firms.

Bangladesh is a developing country with rapid industrialization taking place due to lower labour cost, higher foreign investments and better policies. Bangladesh's main industries are cotton, textiles, jute, garments, tea processing, paper newsprint, cement, chemical fertilizers, sugar and light engineering. The textile and agriculture oriented industry is currently the dominating sectors of Bangladesh's economy which is mainly export oriented. With changes in customer behaviours and buyer requirements, the practices of supply chain are changing to align with global sustainable demands.

In this paper, we collected information by a Google form to reach supply chain professionals from a wide variety of backgrounds in Bangladesh. Then we analyse the data to have an idea over the current practices, future plans and implementations of GSCM in Bangladesh.

2.Literature Review

Internal environmental management is positively associated with green information systems and both appear as antecedents to successful implementation of green purchasing, cooperation with customers, eco-design, and investment recovery. Manufacturing organizations first adopt environmental sustainability as a strategic imperative before modifying existing information systems to capture data and generate information related to environmental sustainability initiatives and outcomes. The first stage in implementing GSCM practices is to embrace the strategy organizationally and to modify existing enterprise resource planning (ERP) information systems to monitor environmental initiatives. The second stage includes implementation of green purchasing, cooperation with customers, eco-design, and investment recovery practices. The associations between the stage one and stage two practices are all positive and significant supporting the proposition that the practices should be implemented in stages. **[Kenneth W. Green Jr et.al]**

The drivers of the GSCM indicate the factors that would speed up the GSCM implementation process. [**Huang et al. 2017]** explored how the GSCM implementation is affected by such internal and external factors. The environmental considerations should be integrated into the corporate culture as the need of GSCM is intensifying. [**Dhull and Narwal 2016**] have reviewed

the literature on drivers for the implementation of GSCM. Their findings provided insights into the drivers of GSCM. Additionally, the drivers of GSCM in six sub-streams, i.e. internal, external, competition, market, customers and suppliers. After reviewing the related literature, the following drivers are found to be potential drivers of GSCM in the chemical industry.

Currently in Bangladesh, the majority of respondents proved that the textile organizations had embraced a redesigned supply chain system to decrease carbon footprint, streamline transportation operations to decrease carbon footprint, eliminate, reduce, and alternately repurpose manufacturing waste, and increase utilization of renewable vitality sources as well as eliminate/lessen hazardous/toxic materials. **[Ahmed et.al 2018]**

Insufficient technology & infrastructure, Inadequate knowledge and support, Unsupportive organizational and operational policy, Financial constraints, Lack of customer awareness on green product, Un-availability of bank loans to encourage green products are the one of the mains barriers for implementing Green Supply Chain Management in Bangladesh**. [Rahman et.al]** 'Support & commitment of top management' has been identified as most important CSF that may force industries to implement GSCM practices to make their business sustainable. **[M.A. Moktadir et.al 2017]**

Controlling pollution in Leather Industries is very hard due to the lack of methods for the implementation of GSCP. Fuzzy Importance and Performance Analysis (FIPA) approach is being applied to find out the GSCP performance level. This study reveals that supplier and manufacturer viewpoints are the most critical aspects. Also, the most important GSCP attributes are designing for recycling water and minimizing waste during manufacturing, participation in an ISO 14001 certification and selection of suitable suppliers based on environmental criteria. **[MD. Shamimul Islam, Ming-Lang Tseng, Noorliza Karia et.al 2017]**

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. **[Mostain Belal, Dr. Arvind Upaddhay et.al 2017]**

Green Supply Chain Management (GSCM) is still in its inception and has not been widely embraced in the textile industry, and therefore barriers hindering its adoption in emerging economy context demand a comprehensive investigation. This research reviews the viewpoints and hurdles in adopting green supply chain management practices in the context of the Bangladeshi textile industry. The research indicates that the most important barrier is that there is low demand from customers and financial constraint resulting from short term little financial benefit to businesses, with lack of government regulations also a commonly faced barrier in adopting green supply chain initiatives. **[Tasmia Jnnat, Syed Mithun, Priyabrata and Rehman Khan et.al 2019]**

In the RMG sector of Bangladesh, the material, manufacturing, distribution system, recovery procedures etc are being analysed to implement Green Supply Chain Management. The garments has encouraged to find green designing of raw materials by using eco-friendly elements which won't affect the environment. Moreover, a guideline has been provided to minimize waste during usage of resources due to limitation of natural resources. **[Dony and Dazmin et.al 2019]**

3.Methodology

Data collection is an important part of any study. Without proper collection, sorting and analysis the facts of the study cannot be obtained. For this reason before observation, data needs to be collected. In this study, data was collected through a Google Survey form which was mailed to 50+ professionals. The response rate was 36%.

2.1 DATACOLLECTION

The data was provided by following professionals with designations mentioned below:

a) Head of Operations and Supply Chain
b) General Manager, Supply Chain
c) Supply Chain/Logistics Manager
d) Supply Chain/Logistics Administrator
e) Supply chain & Procurement Executive
f) Information Technology Manager

g) IT Executive
h) Chief Information manager
i) Procurement Manager
j) Others

The forms were shared using the following social media applications and web applications:

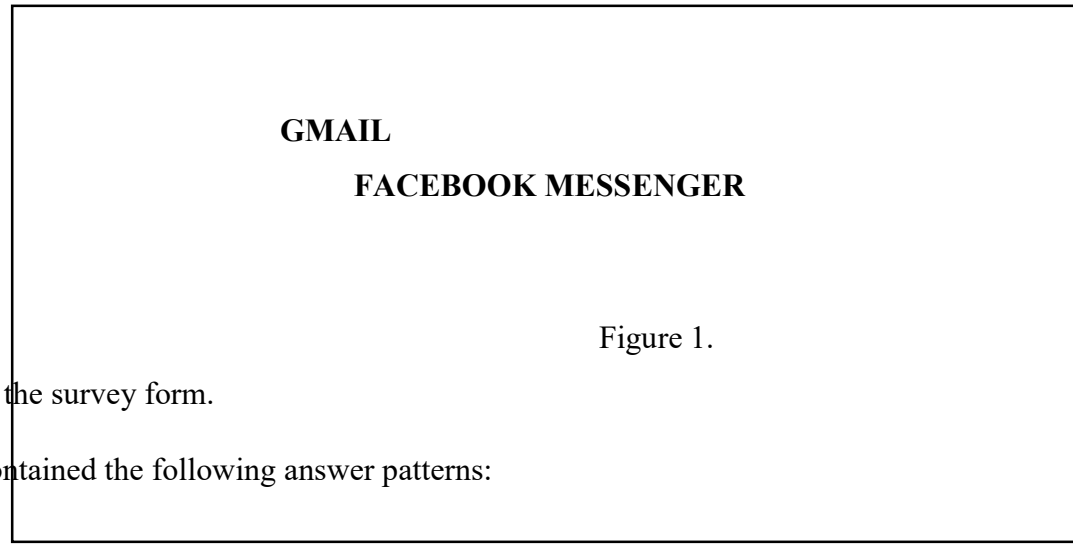


Figure 1.

Applications used to convey the survey form.

The Google questionnaire contained the following answer patterns:

YES/NO	CHECKS	LIKERT SCALE	OPEN ENDED SCALE

The devices used for the data collection and analysis are:

- Laptop: Dell Inspiron 15
- Laptop: HP
- Phone: Xiaomi Redmi Note 7
- Phone: Xiaomi A3

- Phone: Xiaomi POCO X2

2.2. DATA ANALYSIS

Applications used:

MICROSOFT EXCEL 2018

Analysis Tools:

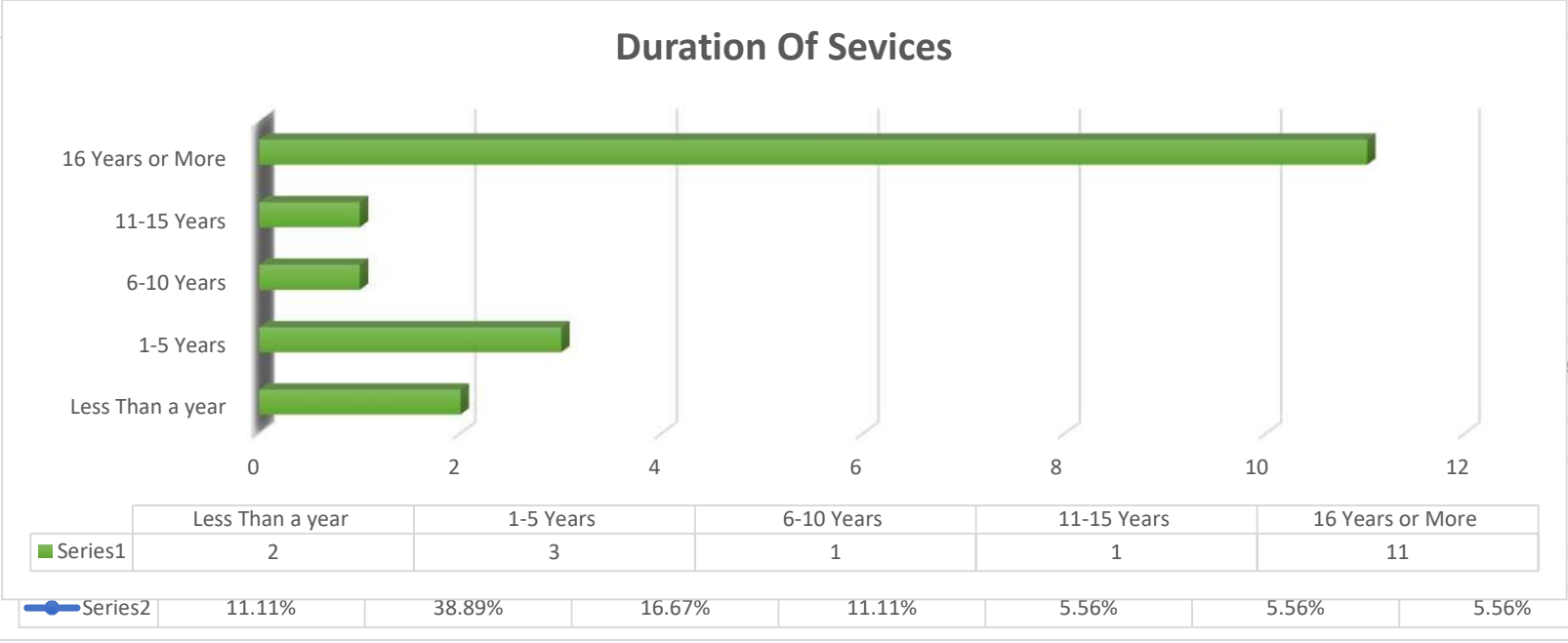
- Pie chart
- Line chart
- Bar chart
- Tables

4.Results and Observation:

This section discusses about the obtained responses and analyses those. Also the observations are also presented here.

4.1 INTRODUCTION TO THE FIRMS: The survey form contained questions to find the type of industry to be studied. This helps on identifying the particular GSCM practices, policies and barriers applicable for each industries. As the manufacturing process, procurement of raw materials, processing and logistics of firms differs based on the type of industry, the study analysed the responses. Table: 1 indicated the pattern of industries studied:

INDUSTRIES	NUMBERS	TYPES
Automobiles	2	11.11%
Food & Beverage	7	38.89%
RMG	3	16.67%
Education	2	11.11%
Information, Media & Telecommunication	1	5.56%
Paints	1	5.56%
Other	1	5.56%



	Less Than a year	1-5 Years	6-10 Years	11-15 Years	16 Years or More
Series1	2	3	1	1	11
Series2	11.11%	38.89%	16.67%	11.11%	5.56%	5.56%	5.56%

Table 1: Types, numbers and percentages of industries responded

Figure 2: Types of industries

Figure 2 indicated that Food and Beverage Industry dominated the survey including RMG. Entries of paint , IT and others had been minimum. Again duration of service by the firms was recorded to have a knowledge about at what stage of organisational life cycle the firm is included. With this knowledge we can predict the growth pattern of supply chain implementations and also find out at what stage the firm initiated the idea of GSCM. The chart in Figure 3 shows the duration of services each firms were being conducted.

Figure 3: Duration of services

Figure 2 indicated that most of the firms that were surveyed were in service for 16 years or more. The percentage here is 61.11% which also indicates that most of the firms that responded are in either growth or maturity stage of the organisational life cycle. This also reflected that most of the firms are already dealing with consumer behaviour changes, technology changes and other changes in production process.

Employee Size determines how big the firm is. The firm size also gives us a rough idea on the overall capacity of a firm to implement and supervise GSCM practices.

Firm Size	Number	Type
Less Than 500	5	Small

500 to 1000	4	Small-Medium
1000 to 2000	3	Medium
More than 3000	6	Large

Table 2: Firm size and type

4.2 GSCM FAMILIARITY AND PRACTICE TRENDS

GSCM familiarity or the information if the responding firm's top management is familiar with the Green Supply Chain Management Practices. The top management of an organisation are responsible for controlling and overseeing the entire organization. They develop goals, strategic plans, company policies, and make decisions on the direction of the business. In addition, top-level managers play a significant role in the mobilization of outside resources. If they are familiar with GSCM practices and trends, then implementations, development, innovation and financing in GSCM increases. Also the decision makers can make suitable decisions if they are familiar with the practices .Chart of figure 4 shows the familiarity of the Top Managements in the survey firms. Here we can observe that 67% of the top managers were familiar with GSCM practices and trends which is a positive result as most of the Top managers are can take decisions and can easily implement the GSCM practices to reduce damage to the environment. Financing of GSCM practices also becomes easier with Top Management's knowledge on GSCM practices.

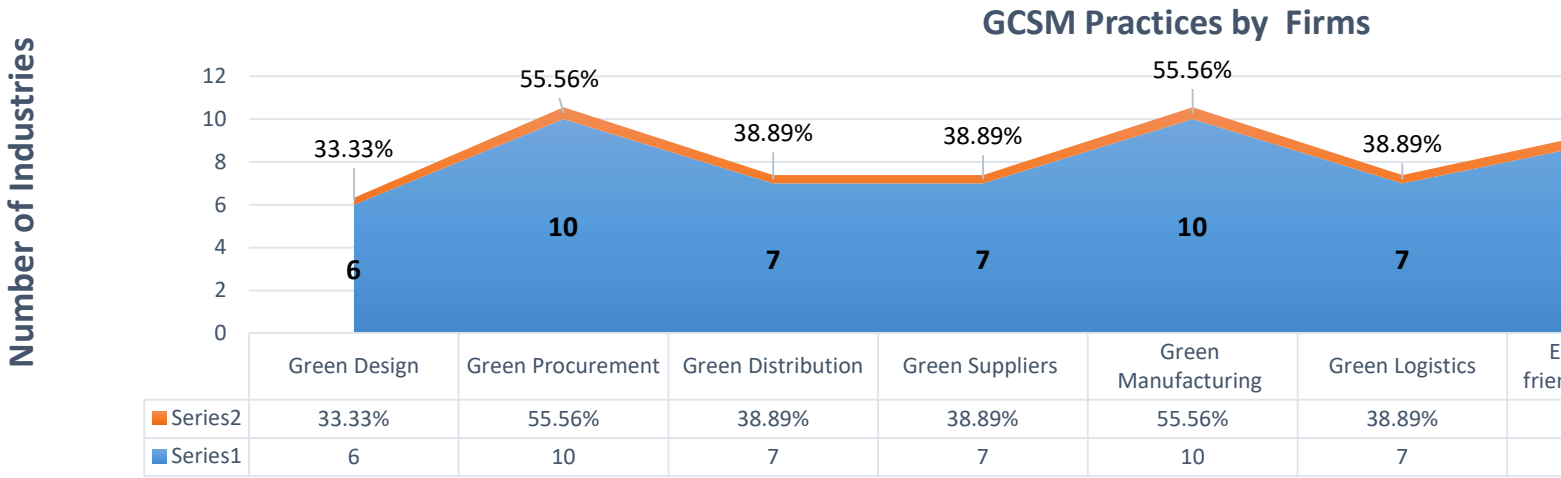


Figure 4: Top Management's Familiarity with GSCM

Now the survey also had questions on how the top management implements the GSCM practices in their firms. The data here was collected via a multiple selection open ended question. Here the responders marked the trending and running GSCM steps already taken by the firms. This data also dealt with the percentage of single processes and number of firm implementing one or more than one practice. Figure 5 contains all the data regarding how the firms practice GSCM .The area chart shows that 55.6% firms go both green manufacturing and green procurement practices. Another widely implemented GSCM practice is environment friendly packaging.

Figure 5: GSCM practices by the firms

Another widely implemented GSCM practice is environment friendly packaging. With an overall view it can be concluded that mot practices are limited only to manufacturing, procurement and packaging departments. Efforts are less on Green distribution, Green suppliers, Green Logistics, Reverse Logistics and least efforts are in Green Design and Investment Recovery. This chart also helps us to study that firms need to work more in the least practising sectors to implement GSCM successfully. Green design practices start at the earliest stages of manufacturing and investment recovery is one of the last stages of a manufacturing idea. The area diagram concludes that GSCM practices should be taken seriously and implemented effectively from early product development, prototyping till the end of chain. The data collected with the green supply chain practices also provided the evidence that the Top Management of large companies are more familiar with the GSCM practices as they have comparatively more scopes of R&D and environmental concerns.

4.3 GSCM POLICIES

The individuals were asked about "Using the Green Supply Chain Management (GSCM) practices is necessary for Legal Compliance'' and they had to rate from strongly disagree to

strongly agreed to the statement. Here it is observed that most of the individuals (39%) agreed and none of the responders disagreed .Also 16% of them were neutral about it.

Figure 6: Necessity of GSCM practice as legal compliance

This data opens new spots form political and administrative decisions of the state or firm's top management influences the GSCM practices in the supply chain methods.

For effective GSCM implementations, adequate resources are important. From the data, it is observed that 55.5% agrees that their top management allocates adequate resources for GSCM implementation. This is half of the total firms. Also the responders agreed that larger companies allocate more resources for GSCM implementations. Thus the smaller firms needed to allocate more resources to implement GSCM.

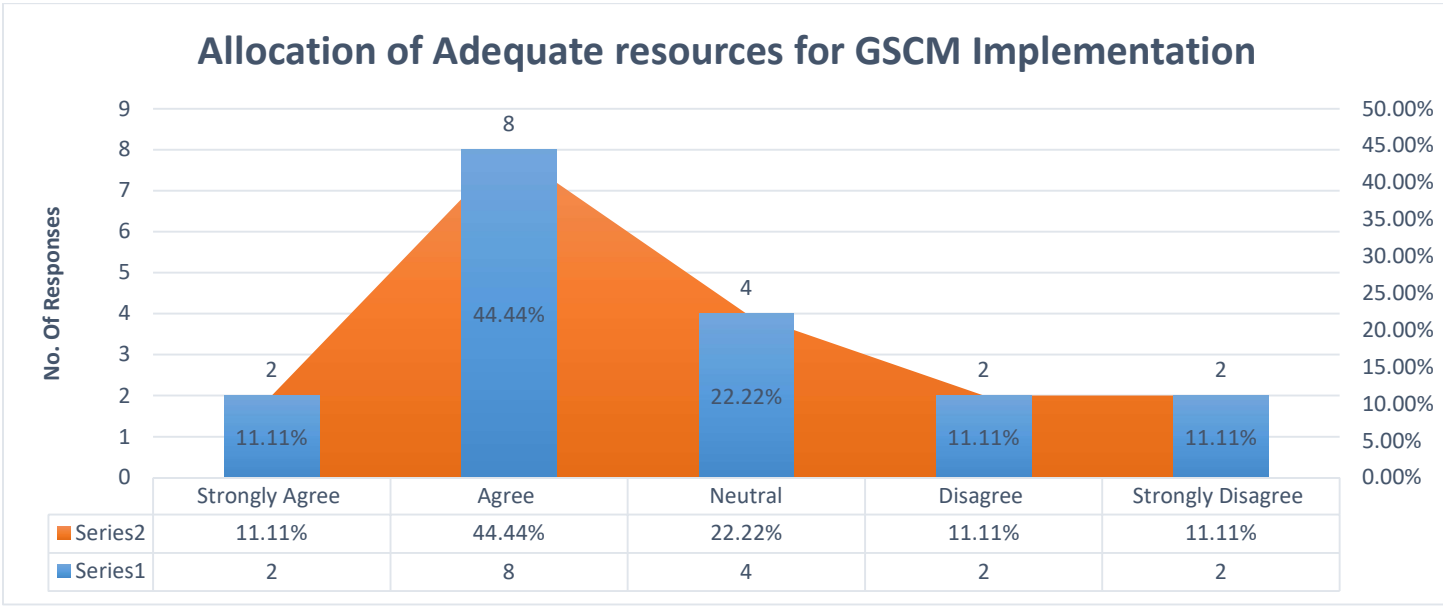


Figure 7: Allocation of adequate resources for GSCM implementation

Also 78% of the people agreed that the large companies can allocate more resources compared to the small and medium firms.22% reacted negative in this question.

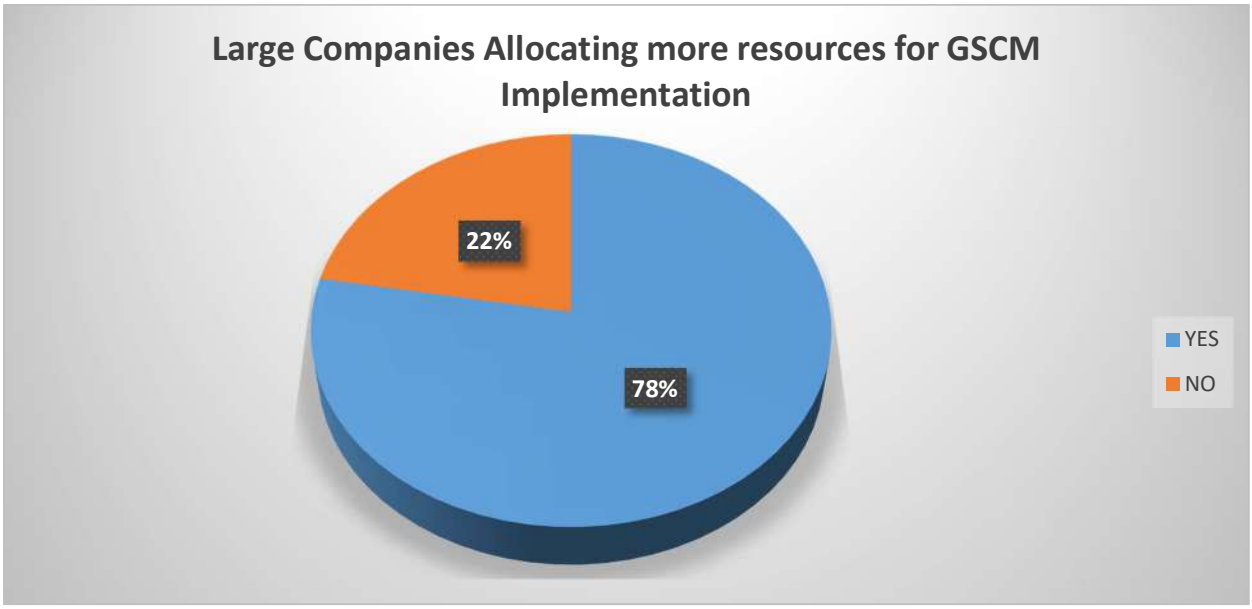


Figure 8. Response of the question that large companies are allocating more resources in GSCM implementation

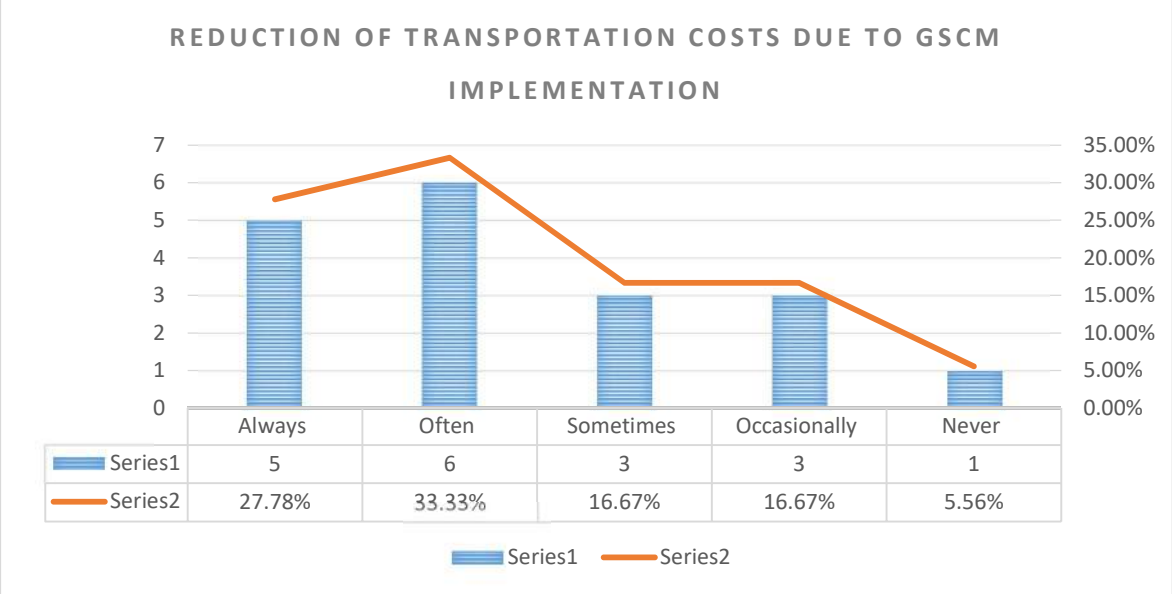
4.4 COST EFFECTIVITY OF GSCM PRACTICES

GSCM practices, after implementation reduces the harmful environmental effects .The practices also result in reduction of firm costs in effluent management and transportation costs. Effluent management had been a challenge for industrial firms. Here, out of 18 firms, 11 claimed that effluent management costs reduced due to intake of GSCM practices in the industry. This happens because GSCM practices reduces wastes before production of effluents.

	1
Strongly Disagree	2
Disagree	0
Neutral	1
Agree	11
Strongly Agree	4

Figure 7: Reduction of Effluent waste Management Costs

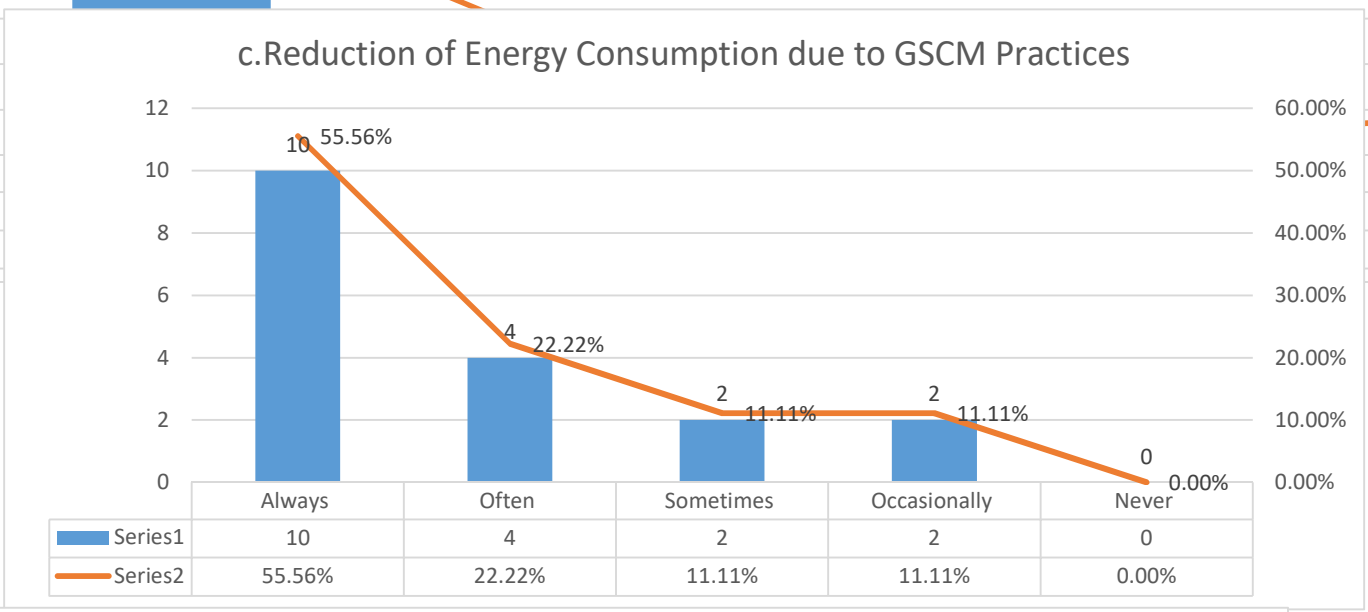
Firms also saw reduction of cost prices often by 33.33% when GSCM practices are implemented effectively (figure 8)

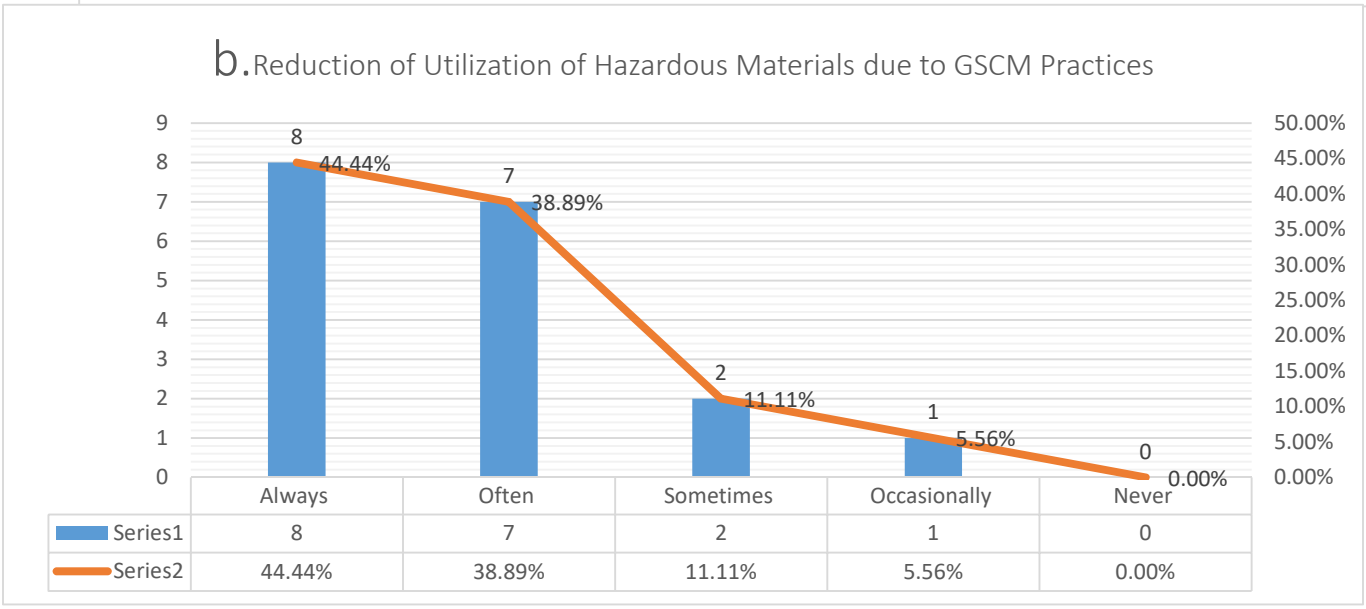


	Always	Often	Sometimes	Occasionally	Never
Series1	5	6	3	3	1
Series2	27.78%	33.33%	16.67%	16.67%	5.56%

Figure 8: Reduction of transportation costa due to to GSCM implementation

4.5 ECO-IMPRESSIONS OF GSCM PRACTICES

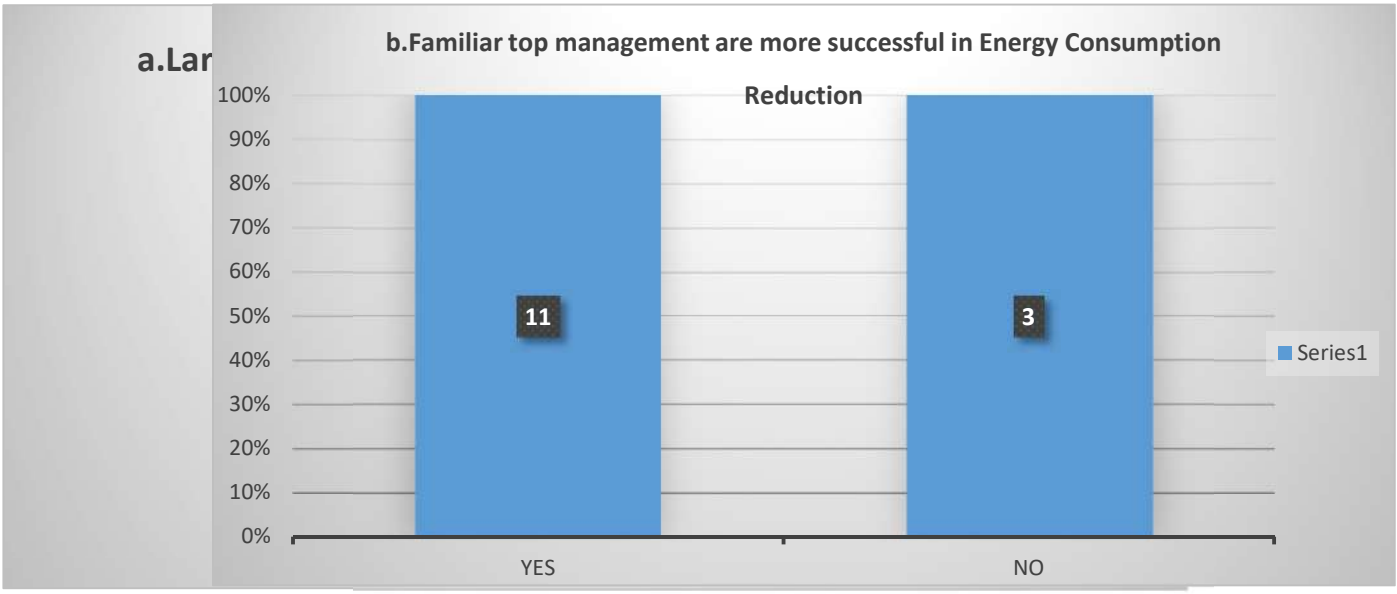




The primary aim of GSCM implementations were

- Reduction of Energy Consumption
- Reduction of Hazardous Material Utilization
- Monitoring of emission of Hazardous Gases

Figure 9(a) monitoring of emission of Hazardous Gases (b) Reduction of utilization



of hazardous materials due to GSCM Practices (c) Reduction of energy consumption due to GSCM Practices

Fig 9 illustrated that almost always the hazard gases were monitored at rate of 66.7%.Also 44.4% responded that always the hazard material utilization reduces and 38.9% by often. Also 55.56% responded that always energy consumption reduced due to GSCM practices .In an energy deficit country like Bangladesh, the response of energy consumption reduction is really a plus point. Also lower energy use resulted in further reduction in energy related costs and sectors.

Again 82% responders from large firms agreed that large firms are monitoring the hazard gas emissions more efficiently compared to the small-medium firms. Out of 11 Large firms,9 firms are able to monitor the hazard gas emissions successfully.

Figure 10(a).Large companies monitoring emissions more efficiently (b) Top Management familiar with GSCM practices more effectively reduces energy consumption

Another benefit of application of GSCM practices in the production and procurement chain is the improvement of health and safety performances 15 out of 18 firms answered positive in the

improvement of health and safety performances.2 replied negative and 1 said maybe. Figure 11 illustrates the fact that GSCM practice improves Health and Safety Performances in the firm.

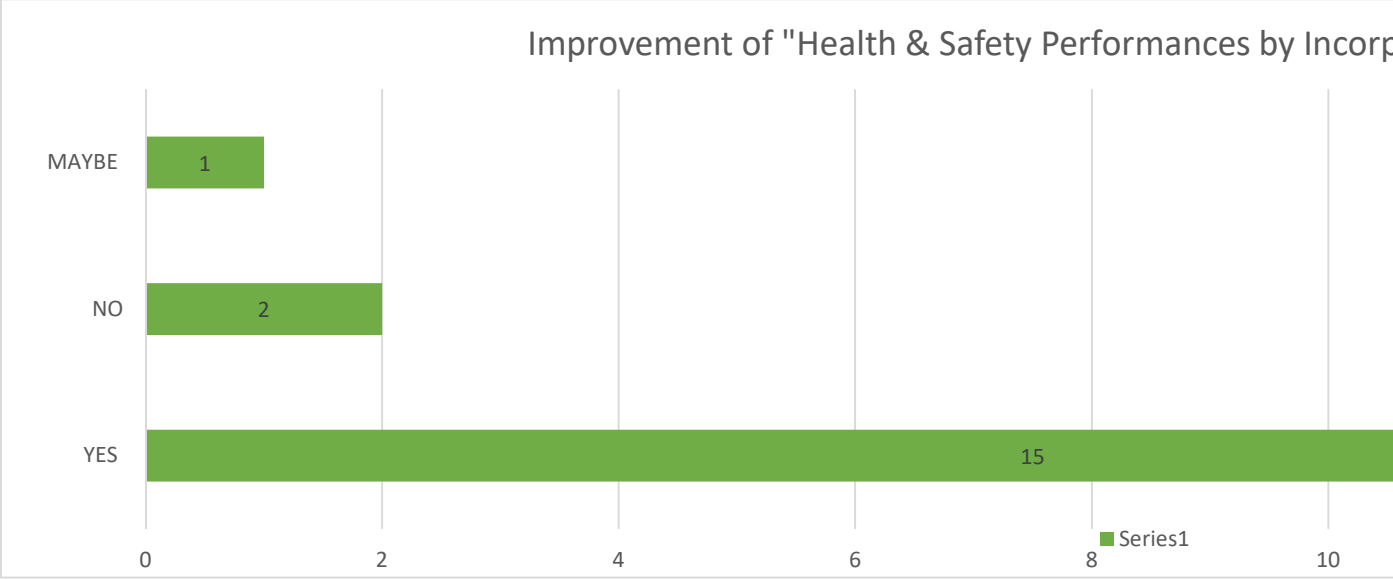


Figure 11. Improvement of Health and Safety performances by incorporating GSCM practices

4.6 GSCM IMPLEMENTAION DEPARTMENTS

Purchase of raw materials and recycling those are important decisions in productions and manufacturing. The graph shows that 7 out of 18 firms are implementation eco-friendly purchase of raw materials and 6 firms out of 18 are implementing the recycling of purchased raw materials.5 out of 18 firms started initiating the implementation of eco-friendly raw materials practice and 4 out of 18 are initiating implementation of recycling and 4 firms are also planning to consider purchase of eco-friendly raw materials. The two charts in figure 12 shows us that most of the firms in Bangladesh either already implementing GSCM practices in procurement or initiating those. Also practices of recycling are highly appreciative.

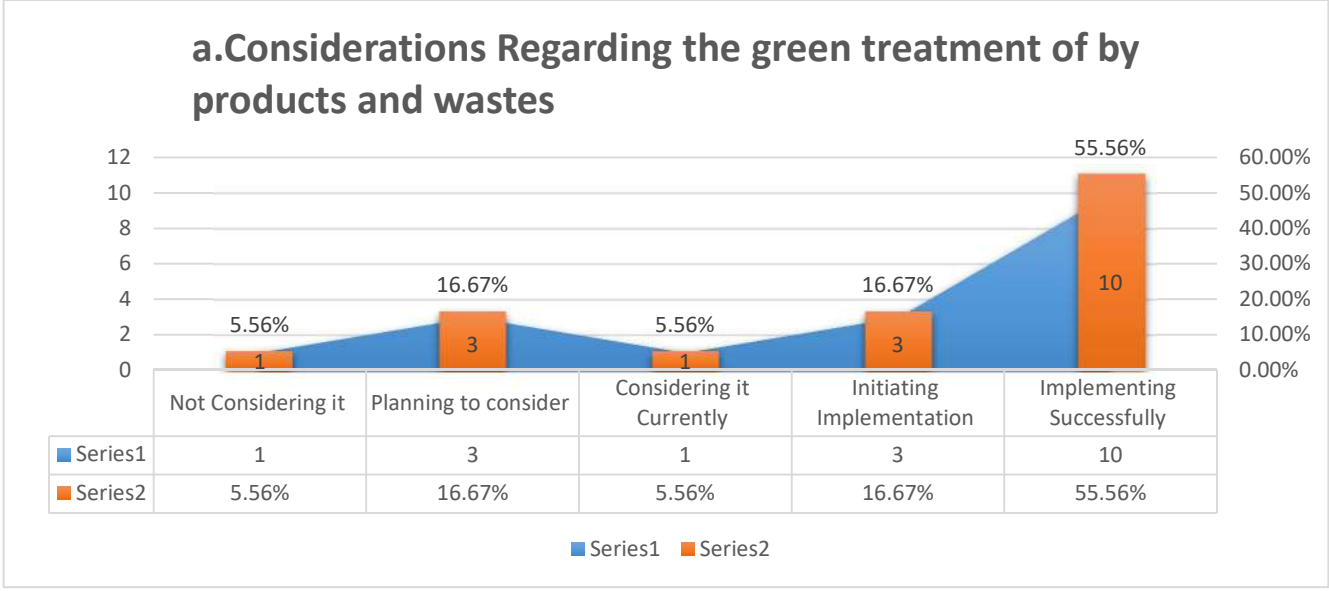


Figure 12.GSCM considerations regarding raw materials (a) Considerations Regarding Purchase of Environment friendly raw material

(b)Considerations regarding the recycling of purchased raw materials

Manufacturing is the heart of supply chain practices .The study illustrated that 55.56% firm's implemented green treatment of by-products and wastes successfully which is 10 out of 18 firms. Also 9 out of 18 firms implemented environment friendly product manufacturing policies. From figure 13, it is evident that most firms are emphasizing or are planning to emphasize the considerations of GSCM practices in the manufacturing department.

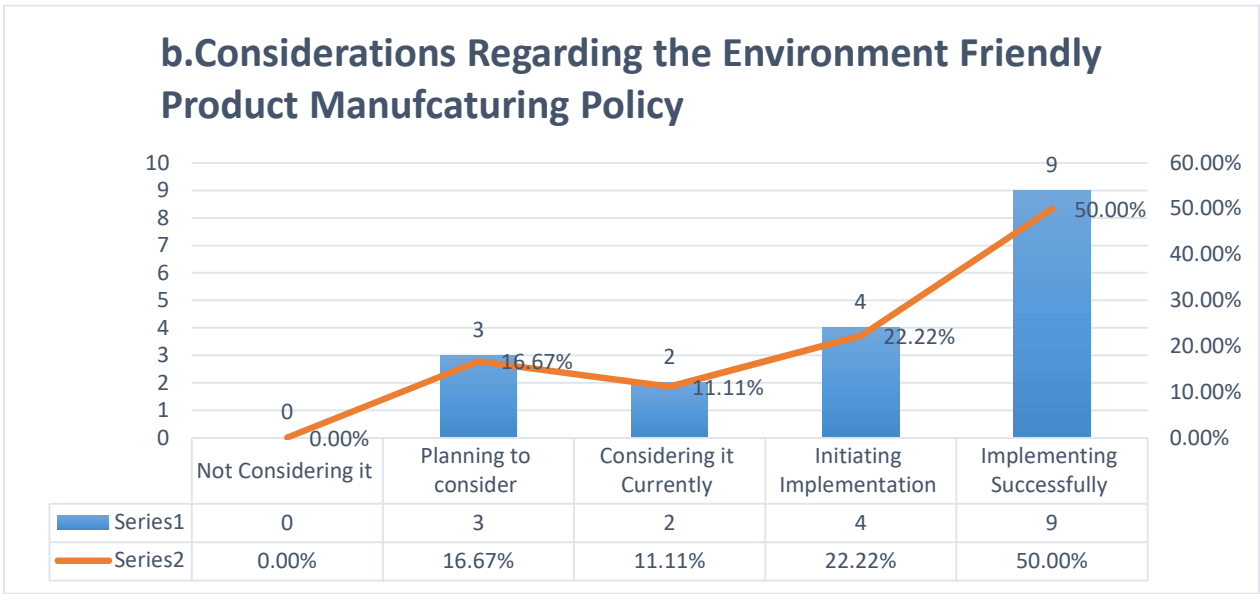


Figure 13. (a)GSCM considerations regarding the green treatment of by products and wastes (b) GSCM considerations regarding the environment friendly product manufacturing policy

5. Conclusion:

From the provided data and analysis it is evident that most of the Bangladesh firms had already implemented or considering to implement or planning to implement. This also reflected the supply chain knowledge pattern and benefits of implanting green supply chain practices. Scopes of further studies are also available as only 18 firms were taken under analysis. Also the study lacked information about the barriers faced by Bangladeshi firms while implementing GSCM practices.

Importance of effective GSCM practices by firms are important to preserve ecological balances, climate changes and as a responsibility to the nature. Better GSCM practices improves productivity, brand value and greener environment. Small and middle sized firms need to be provided with supports to ensure GSCM practices in their firms.

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