

Implementing Sustainability in Global Supply Chain

Wdrażanie zrównoważonego rozwoju w globalnym łańcuchu dostaw

Krishnendu Shaw

*Department of Management Studies, Indian Institute of Technology (Indian School of Mines),
Dhanbad, Jharkhand-826004, India
E-mail: shawkrishnendu@gmail.com*

Abstract

Increasing globalization, unplanned industrialization, and unethical industrial practices have created enormous environmental and social problems. Sustainable development has the potential to handle these problems. Nowadays, environmental and social sustainability are no more considered as voluntary activities to the company. However, these are the needs of the society and human being to survive in the earth. This paper discusses the issues pertaining implementation of sustainability in the global supply chain. The philosophical need of carrying out business from totally profit oriented to sustainable is discussed in this paper. The paper also discusses various operational and strategic issues for implementing sustainability. We conjecture that environmental footprint and social obligations must be monitored beyond the boundary of the country. Environmental footprint and social sustainability should be monitored at each level to make a global supply chain sustainable.

Key words: sustainable development, social sustainability, carbon emission, Corporate Social Responsibility, Global Supply Chain

Streszczenie

Globalizacja, industrializacja i moralnie naganne praktyki przemysłowe doprowadziły do poważnych problemów środowiskowych i społecznych. Szansę na ich przewycięzenie ma konsekwentne wprowadzanie rozwoju zrównoważonego. Obecnie zrównoważenie środowiskowe i społeczne w przypadku firm nie są już uważane za dobrowolne. Są to potrzeby społeczeństw i ludzi, niezbędne do naszego przetrwania na ziemi. Niniejszy artykuł omawia zagadnienia związane z wdrażaniem zrównoważonego rozwoju w globalnym łańcuchu dostaw. Omówiono filozoficzną potrzebę przestawienia prowadzonej działalności gospodarczej z całkowicie nastawionej na zysk na zrównoważoną. Omówiono także różne kwestie operacyjne i strategiczne dotyczące wdrażania zrównoważonego rozwoju. Uważamy, że w zglobalizowanym świecie do analizy śladu ekologicznego i zobowiązań społecznych, perspektywa krajowa nie jest wystarczającą, muszą być one monitorowane z perspektywy międzynarodowej. Ponadto ślad środowiskowy i zrównoważony rozwój społeczny powinny być monitorowane na każdym poziomie, aby globalny łańcuch dostaw był zrównoważony.

Słowa kluczowe: rozwój zrównoważony, społeczna zrównoważoność, emisja dwutlenku węgla, społeczna odpowiedzialność biznesu, globalny łańcuch dostaw

1. Introduction

Over a period of time, globalization has influenced the society and business significantly (Pawłowski, 2013). It has increased cross-border movements of goods and has created new rivals and opportunities across contending supply chains within an industry (Mentzer et al., 2006). In various global supply chain

studies, cost reduction has been found to be an important issue, which has motivated the firm to adopt various strategies like global sourcing, relocation of manufacturing facilities in emerging economies, long-term strategic contracts with suppliers, and many more. Similarly, risk has been observed as an important factor in the literature of the global supply chain. As of now, many researchers have addressed

various risks in the context of the global supply chain (Brammer et al. 2011). Surprisingly, limited studies have been conducted especially addressing sustainability risks (i.e. environmental as well as social) that many global supply chains have been exposed to (Carter and Eston, 2011). Recently, many issues, like the energy price increase, drastic climate change, depletion of nonrenewable energy, emission reduction and concern for improving the quality of life, have drawn significant attention of decision makers towards developing corporate strategies. These factors have also motivated decision makers to migrate in a new era of sustainable development (Chaabane, 2011; Pawłowski, 2008; Pawłowski 2009). However, the main challenge is how to implement sustainability in business. According to Pawłowski (2013), sustainable development can be achieved through three stages. The first stepping stone towards sustainable development is to adopt ethical practices. Pawłowski (2013) also argued for giving equal weights to environmental, social and ecological factors towards implementing sustainability. In the third stage, the firm should focus on the technical, legal and political aspects for managing sustainability.

It can be presumed that the future supply chain operations will be constrained by the availability of raw material, energy, water under the volatility of cost and raw material supply. The similar issues have been pointed out in a report of World Economic Forum (2009). The incorporation of sustainable practices into the global supply chain is a relatively new concept, but it is diffusing steadily (Seuring et al., 2008). This paper tries to explore the main challenges for making a global supply chain sustainable from both environmental and social dimensions and discusses the possible solutions.

Recently, many articles have been written by various researchers in the scientific literature about carbon emissions across the supply chain (McKinnon, 2008; Sundarakani et al., 2011). All of them have emphasized on carbon footprint reduction of the supply chain to survive in the business. Recently, several initiatives have been taken at different levels to cope up ever-increasing greenhouse gases emission in the environment (Chaabane, 2011). These initiatives can be classified as (a) global-level (b) country level and (c) supply chain level. The environmental pollution reduction from the perspective of a global supply chain level has enormous possibilities to save our nature.

In earlier studies, initiatives to minimize environmental pollution were found to be increasing overall business costs, and to happen only because of regulation and taxes. However, there has been a growing consensus that major improvement in environmental performance can be accomplished by using new technologies with a little increment of cost. In addition, environmental performance improvement can also yield a net cost reduction through improved re-

source consumption, process efficiency and quality (Porter and Kramer, 2011). In recent times, environmental and social sustainability (ES) have become crucial issues for conducting business (Jones et al., 2005; Pawłowski, 2009). Researchers like Prakash (2018) and Singh (2018) have advocated the importance of sustainability from a philosophical point of view. The environmental sustainability often encompasses various agenda like energy consumption, greenhouse gas emissions in the environment, water consumption, raw material usage, waste generation, volume of packaging, recycling and use of chemicals for manufacturing, etc. Among these, greenhouse gas emission has emerged as the most important concern factor in recent times. There has been a growing consensus that excessive greenhouse gas emission in the environment will increase global warming, which may become a threat to the existence of mankind (IPCC, 2007; Stern, 2006). To understand the problem it is very imperative to know the operational definition of carbon footprint. The definitions of the carbon footprint are varying from author to author. However, in simple term carbon footprint is the amount of carbon dioxide (or equivalent greenhouse gases) emitted through the usage of fossil fuels for carrying out a particular operation either directly or indirectly (Grub and Ellis, 2007). Researchers have suggested different ways to manage the environmental degradation such as adopting sophisticated machinery, quantifying the pollution, usage of the mandatory footprint for manufacturing every product, ethical use of the resources, change to greener transportation modes, ethical consumption pattern and many more. Implementing sustainability is a herculean task which may be achieved by targeting the problem from multiple facets (Pawłowski, 2007). Before proposing the solution it is very vital to know the evolution of the environmental sustainability concept.

2. Evolution of Environmental Sustainability Concept

During the early 1900s, environmental and industrial pollutions were not the focal concern for management and economic scholars. In economics, Pigou (1920) was the first author, who proposed the concept of taxation for handling industrial pollution. Afterward, significant philosophical debates were initiated for granting fundamental rights to the natural environment (Leopold, 1933; Sarkis et al., 2011). The outcomes of environmental pollution were elucidated to the public by Rachel Carson through his debated book, *Silent Spring*. In this book, the author had criticized the after effects of DDT over the birds and human. The critics had helped in developing the environmental protection laws in the United States in the 1960s (Sarkis et al., 2011). Subsequently, industrial metabolism and material balancing concepts were emerged (Ayres and Kneese, 1969), and further

these theories were refined in the period of 1970s (Ayres, 1978). During the 1980s, the concept of life cycle assessment was crystallized from the various researches of industrial ecology (Erkman, 1997). The widely acclaimed sustainability term was defined by Brundtland commission in the year 1987 as *meeting the needs of the present generation without compromising the ability of future generations to meet their needs* (WCED, 1987; Marrewijk, 2003). In the 1990s, the green supply chain concept had started to shape up. Initially, the green supply chain was conceptualized through embedding environmental factors in operational issues of the traditional supply chain. Subsequently, the triple bottom line concept was proposed in the year 1997 to measure organizational performance (Elkington, 1997). The idea of the triple bottom line is that firm's performance may not be only appraised by its economic bottom line, but it should be done from the perspectives of social, ethical and environmental facets (Norman and MacDonald, 2004). In 2000, researchers across the globe have given significant emphasis on carbon footprint reduction for the supply chain (Halldorsson et al., 2009; Benjaafar et al., 2010). Broadly, the goal of sustainable development is to establish a synergy among economy, ecology, and society.

3. Importance of Corporate Social Responsibility (CSR) for implementing sustainability

The need for protecting the natural environment has been suggested in various literature related to corporate social responsibility (CSR). Many authors and organizations have defined CSR from different perspectives. CSR is the integration of social and environmental aspects in the business operations on a voluntary basis (Commission of European communities, 2001). For more definitions of CSR, readers can refer to the study of Dahlsrud (2006). Different definitions of CSR are available in the literature, but interestingly, the meaning of CSR has differed extensively from researcher to researcher; and their views lie in a range of responsibilities, from purely monetary to purely charitable (Steiner, 1975). Some authors believe that profit-making is the prime requirement for business, and it adds values to society through maximizing the value of stakeholders and employees (Preston and Post, 1975). The counter-argument of the prior thought has been supported by some researchers like McGuire (1963) and Manne and Wallich (1972). According to them, CSR is a charitable corporate exercise that does not cover monetary measure.

Carroll (1979) investigated the relationship between social and economic issues and found that society often admires those firms, which keep the separate social and economic responsibilities separated through assigning some priorities. As per the author, social issue is important but it should be performed when

economic and legal obligations are fulfilled (Carroll, 1979). Apart from these, there are studies which advocate towards pursuing CSR and economic activities simultaneously. For example, Davis (1960) and Hay et al. (1976) suggested to carry out corporate social responsibility in tandem with the economic activities for the betterment of society.

CSR is the fulfillment of requirements that come from the communities in which the firm operates (Carroll, 1979; Clarkson, 1995). According to Hoffman (2000), fulfilling the social obligations often helps firms in achieving better financial performance through minimizing the costly litigations and identifying the wasteful activities in the supply chain operations (Hoffman, 2000). According to Porter and Kramer (2006), CSR is more than a voluntary activity. It is the source of innovation which provides the competitive advantage to the firm. The authors have also advocated for long-term strategic growth as compared to short-term which has been found socially as well as environmentally detrimental in many situations.

4. Importance of carbon reduction from a global supply chain perspective

The importance of carbon emission reduction has been felt across the world to mitigate global warming risk. As a precautionary measure, Kyoto protocol was signed in the year 1997 by various industrialized nations, and further carbon emission law came into force from February 16, 2005 (Lau et al., 2012). As per the Kyoto protocol, ratified parties have to minimize their greenhouse gases emissions in the first assessment period (from the year 2008 to 2012) as compared to 1990 base level. The protocol predominantly suggested three instruments, such as Clean Development Mechanism (CDM), Joint Implementation (JI) and Emission Trading (ET), to enforce the law (Lau et al., 2012). All these initiatives indicate toward a paradigm shift from economic to low-carbon has been gradually happening across the world. This shifting creates substantial pressure on countries as well as on firms towards reducing the carbon emission.

In near future, approximately 80 percent of companies may encounter environmental footprint reduction related risks for their supply chains. In coming times, environmental footprint disclosure will become a mandatory entity to carry out business and failure to disclose the footprint will put the firm in the strategic disadvantage position. Wal-Mart's CEO Lee Scott discussed the importance of reducing carbon footprint across the global supply chain. This can be accomplished through rearranging the channel partners efficiently across the supply chain network. An efficient carbon measurement system will help to develop more efficient operational processes in the carbon-constrained world (Lash and Wellington, 2007). According to Nidumolu et al. (2009), the

firm often feels comfortable to stick to lower environmental standard as long as possible. However, it would be wiser to comply with most stringent rules and to do so before they are put in force. This proactive thinking will help to create a substantial fast-mover advantage in terms of fostering innovation.

As global supply chain deals with multiple markets, cultures, and people, its chance of exposure to carbon risk is more as compared to the domestic supply chain. Although, carbon reduction regulation appears like a distance threat, yet many firms have started to measure carbon footprint proactively to make sure that the regulation, when they come, will fall in their favor (Hoffman, 2004).

For example, Tesco has been actively participating in UK's emission trading scheme and had determined to reduce 74000 tonnes of greenhouse gases over a span of five years within 188 stores (Jones et al., 2005). In the same way, John Lewis has taken various initiatives to reduce the carbon footprint of its logistics system. Global brand Marks and Spencer has given emphasis on the ethical processing of textile garments using specified chemicals. Wal-Mart has been proactively engaged in reducing the carbon footprint of its supply chain. The company instructed their suppliers to reduce the carbon footprints of products or processes as a condition of continuing business with them (Wal-Mart, 2010). Further, the German automaker, BMW implemented life cycle assessment (LCA) technique for quantifying carbon footprint of the product (Koplin et al., 2007). A holistic approach to carbon footprint reduction is very essential to handle climate change risk. As per the author, global supply chain management is probably one of the best available approaches for handling this problem because it deals with the raw material to the final consumption of the product.

5. Strategies for implementing environmental sustainability from global supply chain perspective

Carbon Trust (2011) has suggested that carbon footprint accounting should not be limited to intra-country, as most of the supply chains have become global nowadays. In the broader perspective, a proper accountability of carbon emission for cross country business is extremely important in the current scenario, because emissions from global trade have increased by more than 39 percent since 1990 (Peters et al., 2011). The increase of global trade resulted in a higher amount of embodied carbon footprint flow across the world. Around 4-6 Gigatons (Gt) of CO₂ were found to be embodied in global trade in the year 2004, which was approximately 15-25% of annual GHG emissions across the world. Subsequently, it was found to be increased to 7.8 Gt for the year 2006, which was equivalent to around 30% of global emissions (Sato, 2012). Lack of accountability for embodied carbon emission will

lead to carbon leakage, which may subsequently hinder the mitigation of global warming risk. Therefore, a proper policy is to be executed at the international level to restrict the hidden flow of embodied carbon footprint across the world. These types of policies will significantly affect the sourcing, manufacturing and distribution patterns of the global supply chain. Apart from the above issues, carbon footprint should be accounted from supply chain perspective because at least 75 percent of emissions come from supply chains partners (Trucost, 2012). The findings of Matthews et al. (2008) were quite similar to Trucost (2012). In their study, only 14 percent emission was found to be associated with the direct activities of the company and the rest of the emission was found to be contributed by various supply chain partners. Therefore, the company must focus on the global supply chain perspective to handle the indirect emissions (Plambeck, 2012), which generally come from various supply chain partners.

Carbon Trust (2006) suggested different ways to manage the emission in a supply chain. Their suggested ways are correcting market failure, change of product mix, and supply chain reconfiguration or optimization. World Economic Forum report (WEF, 2009) has made few suggestions for making a supply chain low carbon. Their suggested measures are the collaboration between customers and suppliers, speeding the supply chain, optimization of supply chain network, and reduction in packaging. Matthews et al. (2008) reported the importance of quantifying carbon footprint for the supply chain. The authors suggested that the largest source of carbon footprint should be attacked first with a cost-effective manner in order to reduce the emission of the whole system. Many researchers and scholars suggested different ways to minimize the carbon footprint of a supply chain. Few suggested ways are supplier selection (Hsu et al., 2013), lot sizing (Bonney and Jaber, 2011), supply chain network design (Abdallah et al., 2012).

6. Strategies for implementing social sustainability from the global supply chain perspectives

Social sustainability is an imperative element for the current business scenario. It has to be handled properly; otherwise, it may lead to embarrassment and customer loss. For example, sports textile and shoe manufacturing company, Nike, faced a huge embarrassment when various NGOs shouted against adoption of unethical sourcing practice from various developing countries.

This embarrassment created a negative impact on the buyers and further resulted in a significant loss of customers and brand loyalty across the world (Amaeshi et al., 2008). Adoption of efficient globally sustainable enterprise strategies result in, increase in profit, operational efficiency and commu-

nity interactions, and a decrease in waste, cost and environmental resources (Closs et al., 2011). Business sustainability is relatively a broader issue, which often encapsulates agenda like environmental sustainability, social sustainability, and economic factors. The social issues like the poor wage, high discrimination based on religion, caste, color, high overtime, child labor, poor basic health facilities, poor sanitation facility etc should be considered in the supply chain level to implement the sustainability properly. Sustainability cannot be achieved merely implementing the environmental measures but it should also cover the social and ethical factors. A policy in the global supply chain level may help to curb all these problems.

7. Adoption of proper measurement technique

To implement environmental sustainability it is very important to measure the environmental footprint properly. Carbon footprint has been slowly recognized as a yardstick to measure the environmental sustainability of the supply chain. Theoretically, carbon footprint can be measured from the perspectives of the firm as well as product.

Numerous methods are available in the literature to calculate the carbon footprint of a product (Chakraborty and Roy, 2013); for example, Publicly Available Specifications (PAS) 2050 developed by the British Standards Institution (BSI). The PAS 2050 standard was proposed for measuring the carbon footprint of the product. The standard adopts the Life-cycle Assessment (LCA) approach for computing the greenhouse gases for manufacturing goods as well as services.

Apart from these, other standards are also available in the literature. Few examples are GHG Protocol by World Resources Institute (WRI) and Product Life Cycle Accounting and Reporting Standard by the World Business Council for Sustainable Development (WBCSD) (Chakraborty and Roy, 2013). International Organization for Standardization (ISO) has been engaged in developing a standard for calculating the carbon footprint of a product, namely ISO 14067 (Chakraborty and Roy, 2013). Carbon footprint is generally assessed by three types of approaches such as bottom-up, top-down and hybrid (Peters, 2010). The bottom-up methodology applies LCA principle, which computes environmental footprint of product from cradle to grave. Bottom-up method is primarily applied for measuring the carbon footprint of the small entity (Peters, 2010). Various researchers applied this methodology to calculate the carbon footprints of products such as denim jeans, papers (Boguski, 2010), milk (Flysjö et al., 2011). The top-down approach is applied for measuring carbon footprints of large elements like sector, region, and country. The top-down calculation is based on the Environmentally Extended Input-Output Analysis (EE-IOA) (Pandey et al., 2011). A

hybrid approach is the mixture of two above discussed approaches (Lenzen and Crawford, 2009). The choice of carbon footprint measurement methodology depends on the type of entity. To implement sustainability is very crucial to apply the right method to the right entity. In addition, it is also important to know the proper boundary of the environmental footprint.

8. Factors that mobilize to implement sustainability in the global supply chain

8.1. Regulatory pressure

Regulatory pressures are usually related to an organization's decision to implement an environmental management system (Darnall, 2003). Delmas and Toffel (2004) conceptualized regulatory pressure as coercive pressure. This pressure has been found to be created from the menaces of noncompliance and penalties (Davidson and Worrell, 2001) and obligations to disclose information about the toxic and chemical release to the public (Konar and Cohen, 1997). According to institutional theory, the behaviors of organizations have been found to be influenced by two primary mechanisms such as imposition and inducement (Scott, 1987). The influence can be exerted through various regulatory institutions and government bodies (Oliver, 1991). Rivera (2004) suggested toward creating a trade barrier to apply coercive pressure over the firm. For example, there are many international bodies, such as European Community Directive on Waste Electrical and Electronic Equipment (WEEE), which monitor the potential hazards in the product before allowing to enter in the country. According to Zhu et al. (2013), the electronics industry in China has been greatly affected by these types of laws. The authors considered export country's regulation as one of the important coercive pressures. The pressures from various foreign regulatory authorities help to diffuse the corporate environmentalism among the manufacturers of developing countries. This diffusion takes place through disclosing data pertaining to environmental pollution, carry out environmental auditing of the manufacturing facilities and enforcing third-party certification of the environmental management system (Stalley, 2009).

8.2. Market pressure

Market pressure is another mobilizing factor for implementing various environmental and carbon reduction initiatives in the supply chain. This pressure has been found to be generated from various needs of downstream customers and consumers (Zhu and Sarkis, 2007). According to Zhu et al. (2013), market pressure has forced many Chinese manufacturers to reassess their environmental practices to survive in the global market. In many cases, environmental sustainability has been found to be a pre-requisite to carry out business with foreign customers (Zhu et al.,

2013). Many times, end consumers' preferences to buy green product create significant pressure over manufacturers to implement environmental practices. Most of these pressures have been found to be shifted to manufacturers through big retailers like Wal-Mart, Gap, Tesco, etc.

According to Hoejmose et al. (2012), business to customer (B2C) sector has faced great pressure for implementing green practices due to high consumer pressure, media inspection and quick observability to stakeholders (Hall, 2000). Bowen (2000) also noticed that firms, having more consumer recognition and high advertisement spend, have been found to be exposed the higher level of pressure for environmental accountability as compared to their rivals. Customer's pressure forces organization to integrate environmental practices, which help in increasing the performance of the firm (Kagan et al., 2003). Hill (1997) found that environmental pressure migrates from customer's end to manufacturer's end and manufacturer's end to their suppliers' ends. In almost every case customers hold the balance of power unless there is any monopolistic situation.

Market pressure plays a pivotal role in accepting environmental practices. There are ample examples in the literature divulging the role of market pressure for implementing sustainability. For example, environmental friendly textile products, like GOTS certified, OEKO Tex certified and Bluesign certified, are becoming more popular among the customers (Wu et al., 2012). Many retailers across the globe are keeping low carbon products in their retail shelf. For example, UK based retailer, Tesco, has introduced carbon label over product packaging in the retail business. Wal-Mart is creating pressure over its suppliers to reduce the energy consumptions. Many textile and apparel manufacturing companies introduced the code of conduct for their suppliers to manage the social and sustainable issues. For example, Li & Fung, Levis Strauss, Nike, Adidas, GAP and many more have introduced different codes of conducts that need to be fulfilled for being a supplier of these companies. Increasing carbon emission consciousness among customers and consumers create market pressure significantly.

8.3. *Competitive pressure*

Competitive pressure plays a pivotal role in greening or carbon reduction of the global supply chain. According to Krafft (2000), competition can be viewed as a rivalry among the firms and it takes the shape of the contest within an existing market and also applicable for potential penetration into a new market. Competition can be influenced by various factors such as product price, new production technique, and the availability of information to consumers pertaining to the products (Krafft, 2000). Competitive pressures are generally created from the interactions of the aforementioned factors. A couple of researchers in green supply chain assumed competitive pressure

as the mimetic pressure. Many authors (Blundell et al., 1995; Nickell, 1996) found competition as a source of innovation. A competitive pressure can drive the firm to adopt green practices (Zhu and Sarkis, 2006). Adoption of pro-environmental practice helps firms to gain a competitive advantage over its rivals (Wagner, 2005). For example, if a firm introduces a green or low carbon product in the market with the competitive price then it may create competitive pressure over other existing players. To survive in the market other players have to mimic their rivals' strategies and should come out with a comparable sustainable product.

The competitive pressure over a firm depends on the environmental or carbon reduction strategies adopted by its competitors. For example, a garment manufacturer, Levi Strauss, discloses the carbon footprint of its jeans pant. The voluntary disclosure of carbon footprint can create extra pressure over its rivals towards reducing their products' footprints. The rival firms are obviously assumed to be a low performer if they fail to disclose the carbon footprints of their products.

8.4. *Organizational support*

Organizational support plays an import role in the adoption of green practices. Organizational support has a different meaning in the context of organization management literature. According to Eisenberger et al. (1986), organizational support is nothing but the employees' discernments about the extent an organization cares about their interests and appreciates their contributions. It has been found in the studies (Eisenberger et al., 1997) that employees subjected to a higher level of organizational support are in some extent more interested to refund the positive thoughts and work behaviors to the organization.

It has been widely accepted that top management support plays a vital role in the successful implementation of innovative and technological programs and activities in a firm (Hamel and Prahalad, 1989). Therefore, if a firm wants to implement green or low carbon practices then their top management must be committed to it (Zsidisin and Siferd, 2001). Top management must communicate the advantages of implementing environmental practices to their employees, and they should inspire them to take part in environmental activities (Poksinska et al., 2003). Carter et al. (1998) argued that not only top management's, but the middle management role is also very important to effectively execute the environmental practices in a supply chain. Christensen and Rasmussen (1998) emphasized employees' participation for better execution of the environmental system. The authors argued that people are more willing to follow environmental procedures if they create those. The pro-activeness of middle management often helps to implement green or low carbon practices better in the supply chain (Bowen et al., 2001). Top management

commitment effectively motivates the environmental orientation of the firm (Banerjee et al., 2003).

8.5. Green Practices

The green supply chain has drawn considerable attention in recent times. The intention of any green practice is to reduce the environmental impact, which in turn may help to exaggerate the performance of the firm. The elements of green practices are diverse in nature and often varied from research to research. However, factors like internal environmental management, green purchasing, and eco-design have been extensively suggested by researchers to determine green practices (Shukla et al., 2009). The below section further discusses the literature relevant to internal environmental management, green purchasing, eco-design, and carbon-constrained operational strategy.

8.5.1. Internal environmental management

Internal environmental management is comprised of a set of actions, processes, and procedures, which help to meet the general environmental preservation goal of a company (Zhu and Sarkis, 2004). Internal environmental activities are intended to reduce inefficiency through synchronizing engineering, quality, and marketing departments (Walton et al., 1998). Activities, for example, ISO 14001 certification, eco-labeling of product, and environmental audit of departments often help to establish internal environmental management in the firm (Klassen and Johnson, 2004).

Effective implementation of an environmental management system necessitates the compliance of internal systems and frequent audits of environmental performance. A third-party verification may be carried out once in every three years for proper implementation of the environmental management system (Morrow and Rondinelli, 2002). They found that internal environment management can significantly help firms to reduce the energy consumption and waste production. As carbon emission reduction is associated with energy consumption, therefore a proper internal environmental management strategy may help to reduce the carbon footprint of the supply chain.

8.5.2. Green purchasing

Purchasing plays a critical role in achieving the environmental goal as well as reducing the cost of the supply chain. Green purchasing intends to adopt a set of policies, actions, and relationships among the supply chain members to deliver the intended environmental performance of the firm. Many researchers suggested that supplier is a key strategic partner, who can be a part of various environmental initiatives of the focal firm and also helps the firm to achieve their environmental goals (Bowen et al., 2001).

A higher collaboration with suppliers often helps to achieve superior environmental performance as well as fulfilling customers' environmental desires (Theyel, 2006). Purchasing has been found as a most powerful change agent as compared to any other operational practices in the supply chain (Preuss, 2001). Nowadays, the eco-labeling issue has become the most important factor for green purchasing. For example, a fabric certified with GOTS can be termed as sustainable or environmentally friendly.

8.5.3. Eco-design

Eco-design is one of the important aspects of green practices because on an average 80 percent of the lifetime cost of a product depends on the design of the product (Pujari et al., 2003). An efficient product design has numerous benefits, which many companies have started to realize. It helps to reduce material usage, waste, disposals and recycling fees, which subsequently help in reducing the overall cost of the product. Eco-design advocates toward choosing proper eco-friendly materials that help to minimize the environmental burdens while manufacturing of products (Bovea and Gallardo, 2006). The eco-design has huge significance for reducing the carbon footprint of a global supply chain. The carbon footprint of any material is significantly influenced by the types of chemicals and process parameters used. For example, AVITERA SE, a chemical produced by dye manufacturing company HUNTSMAN, can significantly help to reduce water as well as the carbon footprint of the textile material.

8.5.4. Carbon constrained operational strategy

Carbon constrained operational strategy is a new dimension of green practices suggested in this study. As per Benjaafar et al. (2013), an operational strategy can significantly affect the overall carbon footprint of the supply chain or manufactured product. A suitable operation strategy can reduce carbon footprint without significantly increasing the overall supply chain-oriented costs. For example, ordering frequency of procurement can significantly increase or decrease the carbon footprint of a global supply chain. A bulk order is often assumed as environmentally friendly but also responsible for huge inventory cost and emission if the material belongs to perishable categories (Benjaafar et al., 2013). In the same line, JIT (just in time) procurement may significantly increase the transportation emission due to the requirement of high replacement frequency. On the other hand, efficient supplier selection leads to minimization of overall sourcing footprint. Some authors have advocated for supply chain network design for minimizing the overall carbon footprint.

9. Conclusion

Implementing sustainability is a real challenge which human being is currently facing. There are various methods available in the literature that advocate making the system sustainable. Unfortunately, a single approach may not be sufficient to make the system sustainable. This paper tries to articulate a few important issues in the direction of implementing sustainability in the global supply chain. The first and foremost thing is that the decision maker should think beyond the boundary of a country to manage the environmental and social issues. The environmental footprint and social factors should be given equal importance to the cost factor. The environmental and social elements should not be considered as a charitable activity; it may be incorporated in the corporate culture as mandatory efforts. The top management of the global supply chain must give more importance to reduce environmental footprint and they should motivate the middle and lower management to enforce sustainable practices. It can be also noted that sustainability implementation cannot succeed without the active participation of the customers as well as stakeholders. The firms should put more effort to increase the consciousness of the customers towards environmental pollution and encourage them to purchase sustainable products. The sustainable supply chain concept will not survive without the demand for eco-friendly products in the market. Therefore, a suitable marketing policy to be taken to motivate the customers.

The environmental footprint can be reduced by continuous monitoring of the production process, consumption pattern, transportation pattern, and demand pattern. A mismatch between demand and supply may lead to unnecessary production as well as misuse of precious resources. The environmental footprint can be reduced by decreasing the speed of the supply chain or decreasing the agility of the supply chain. Hence, the human being should act more consciously to implement sustainability. The government should enforce mandatory environmental footprint disclosure policy over the company to operate in the market. To make the global supply chain sustainable every element must work in a synchronized manner. The limitation of the current study is that it has predominately given more emphasis to the environmental and social factors. The issues like water footprint and reverse logistics may also come under the umbrella of sustainable development. Therefore, future research may be conducted by addressing the aforementioned factors.

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