

The relevance of green practices worldwide: an overview

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Abstract

Purpose – The paper consists of a literature review about the green supply chain management (GSCM), a concept which has been gaining ground around the organizations worldwide. The traditional supply chain (SC) was forced to evolve in GSCM as an option for companies to improve their economical, operational and environmental performance. The purpose of this paper is to highlight how green practices (GP) have a powerful dependence to the SC execution from companies around the world. A GP can be briefly defined as the actions being consciously done being responsible to the environment.

Design/methodology/approach – The paper is exploratory. The topic was delimited through a review of similar papers, analyzing the different type of tools and the GP considered in each paper. For last, a conclusion will be exposed.

Findings – The “green movement” within the SC is increasing fast around the world, since the increasing awareness of industrialized countries are recurring in practices that impact directly to the environment. Therefore, costs of extra energy consumption are generated, as well as the imminent worrying reputation among customers due to the lack of responsibility to the environment.

Research limitations/implications – The document only covers the topic from a theoretical aspect through a literature review.

Originality/value – This paper covers not only strategies related to GSCM and GP from European and Asian countries are approached, but also Latin American performance, exposing briefly the adoption of GSCM.

Keywords Green logistics, Green transport, Green supply chain, Green practices

Paper type General review

1. Introduction

The globalization has brought dramatic changes on how the world works, specifically the international trade of goods and services in the last decades. Within the international trade, the SC is not the exception at a local and global level. However, this huge transformation also brought other kind of issues; being the environmental pollution one of the most worrying matters nowadays. Although there is a list of questions to be asked, the selected research questions for the paper are:

RQ1. How the supply chain (SC) has affected the environment?

RQ2. Is there a cost to pay for the use of the resources or non-renewable energies? If so, which stakeholder is paying for it: the customer, the companies or the environment?

RQ3. Which are the strategies proposed by leader nations related to the implementation of green practices (GP) and green supply chain management (GSCM)?

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The document is structured as follows: first, the design of the methodology proposal will be presented, followed by justifying the principal reasons of taking care of the environmental pollution and how industrial activities directly impact in the environment. Previous studies concerning the importance of GSCM and GP are shown with its findings. The selected GP will be briefly defined. Also, will be mentioned the strategies from leader nations in green topics such as the European Union (EU), Latin American and Asian countries. Finally, a conclusion and an opinion will be provided from the author.

2. Research methodology

The main purpose of explaining how the research methodology is integrated, is to comprehend how the research is being done in a scientific approach (Kothari, 2004).

The paper is a result of an exploratory and qualitative research. First, there was a topic delimitation from a literature review in similar subjects. Once the delimitation was finished, a structured concept research started through the database of the Universidad Autónoma de Nuevo León through multidisciplinary and economic and administration magazines. Editorials such as Science Direct, Emerald, Springer, Elsevier and data basis such as Google Scholar and SciELO were employed. The keywords “Green Supply Chain Management,” “Green Practices,” “Green Supply Chain Impact,” “Green Logistics” were employed to get the most related articles in the topic and obtain higher accuracy.

To dispose the unnecessary articles, a filter was established for documents covering topics related to GSCM and GP; and the ones which not described topics related to the project in its abstract, were eliminated from the research. A total of 43 sources in a ten-year period (from 2008 to 2018) including papers, official government websites and other sources were considered for this paper are listed as follows in Figure 1. Figure 1 shows the sources classified by year; identifying an increasing trend on the sources related to this topic since 2015.

3. Previous studies

Awaisheh and Klassen (2010) defined GP as activities or strategies implemented by companies to mitigate the environmental impact. Researchers over the world have struggled in explaining how the GP may be helpful within the supply chain of the organizations in their localities, also providing realistic scenarios for detecting opportunity areas for the GSCM enforcement. In Table I, there is a summary of their principal contributions.

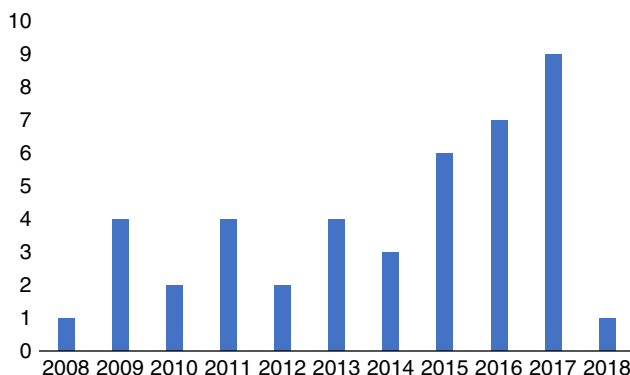


Figure 1.
Number of reviewed
sources by year

Table I.
Findings related
to GSCM and
GP subjects

Author	Year	Findings
Kim <i>et al.</i>	2011	GSCM administration is essential to improve company's performance
Diabat and Govindan	2011	GSCM emerges as a solution for the environmental risk minimization
Green <i>et al.</i>	2012	The GP adoption in the organization improves the environmental, economic and operational performance
Laosirihongthong <i>et al.</i>	2013	The key factors for organizations considering the transition to a GSCM: the improving of their reputation and image to the market, stimulate productivity and quality and attract a growing market of customers with a higher conscious of the environmental impact
Cosimato and Troisi	2015	To achieve a successful GSCM, is expected from the suppliers to schedule their routes focusing on their optimization, to displace the less possible and avoid the pollution through the transport utilization
Ai <i>et al.</i>	2015	Due to a rise in the competition in the 1990s, companies started to be aware on applying GP, acting ethical and responsibly in their SC
Caniëls <i>et al.</i>	2016	One of the advantages for companies on adopting a GSCM relays on the economic opportunities, by minimizing their costs in raw materials and improving the waste quantity when going green on their processes
Lyon and Van Hoof	2016	The principal reasons for companies to "greening" their operations were: cost savings, earn a positive reputation and to be more competitive
Torres-Salazar <i>et al.</i>	2016	Despite the fact the managers were enthusiastic to adopt GP, the region was in a basic stage on planning the execution of these activities
Mishra <i>et al.</i>	2017	Due to the latent pressure coming from environmental pollution in companies, GSCM emerges as high-powered tools helping to improve the reputation with the stakeholders, getting profit and market share, improving their ecological efficiency at the same time

4. Background

Evidently, the pollutant actions have impacted in every single aspect worldwide. According to an inform published by the US Environmental Protection Agency, China is the most polluted country in the world, contributing with a 30 percent of CO₂ emissions; the USA goes at the second place with 15 percent, and the EU in third, with 9 percent. On the other side, Asian countries such as India and Japan were responsible of approximately 7 and 4 percent pollution, respectively (Boden *et al.*, 2017).

One of the main pollutant sources comes from the industrial sector. This was confirmed by the Utah University in an investigation showing that approximately 1.8m kg in materials are used annually by companies to satisfy the needs of an average family in the country (Bradford, 2015).

The previous paragraph confirms that SC and subjects related should receive more attention and be the topic of study. To determine how this could be improved must be covered from the organizations either in an operative (Feng *et al.*, 2018) or economic aspect (Geng *et al.*, 2017), and at the same time the environment in a medium- and long-term horizon.

5. Supply chain

The definition of SC has evolved through the addition of more specifications about how the process; nevertheless, the main idea of what SCM has not been modified. According to The Council of Supply Chain Management Professionals defined it as the planning and management of the activities involved in sourcing and procurement, and all logistics management activities; including also the coordination and collaboration between the channel participants, such as suppliers, third-party intermediaries and even customers (CSCMP, 2013).

5.1 Green supply chain management

GSCM is an adaptation from the traditional SC with environmental intentions; being its main objective to mitigate the potential impacts to the environment. Hervani *et al.* (2005) defined GSCM as “the addition of green purchasing, green manufacturing and material administration, green marketing and distribution, and reverse logistics.”

Figure 2, based on the previous definition, shows the key entities working in a GSCM environment, in which traditional SC entities are connected to the GP in GSCM, displaying how reverse logistics participates once the product has reached its end-of-life (EOL) cycle, returning to close the loop (Singh and Trivedi, 2016).

6. Green practices

For the successful adoption of the GSCM, it is important to study the activities related to this discipline. The GP are helpful for the SC performance and sustainability, and their image as an organization through an environmental mentality in logistics tasks for helping the society development (El-Berishy *et al.*, 2013). One of the benefits of these practices includes the waste reduction, air and water emissions decreasing, and a better energetic efficiency (Norris, 2009).

After a profound literature review of GP exposed by different authors, four were selected for a deeper analysis shown in Figure 3.

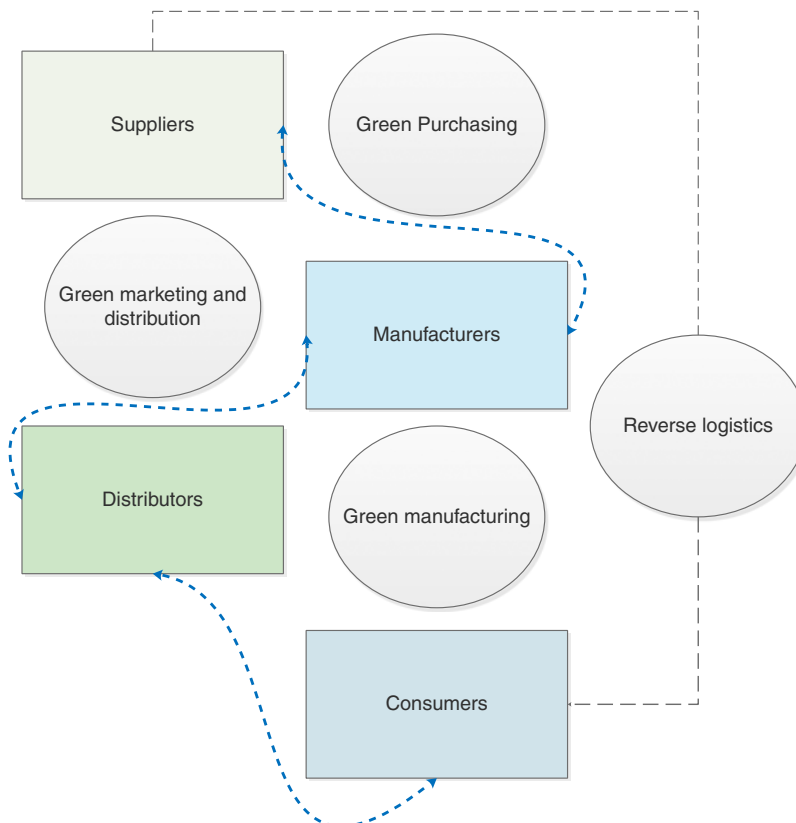
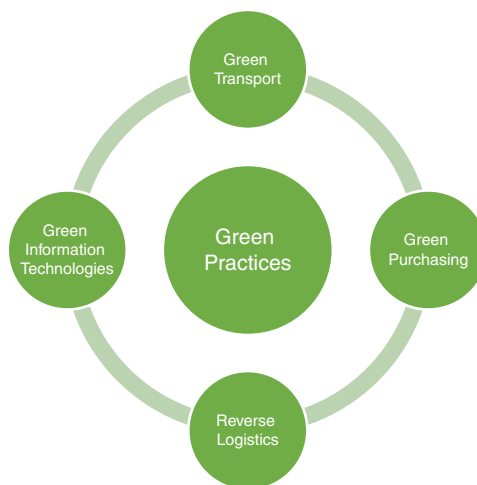


Figure 2.
Entities involved in a
green supply chain

Figure 3.
Green practices
in GSCM



6.1 Green transport

Green transport emerges to contrast the critical situation that the transportation is experiencing; considering it as the most employed activity within logistics. Transportation has a significant role for expanding the industrialization around the world; being responsible as well for the increasing environmental issues due to the carbon emissions. (El-Berishy *et al.*, 2013).

Nations such as the EU have implemented strategies to help in diminishing the impact generated by transportation, because in 2014 EU was the one that generated the biggest quantity of greenhouse gases (GHG), representing more than the 70 percent of its total emissions. They focused primarily on the employing advanced biofuels, electricity and renewable synthetic fuels with the objective of working on the transition to zero-emission vehicles. European cities and local authorities perform a significant role through stimulating the alternative energy and low-emission automobiles (European Union, 2017).

The UK has been working on enhancing the green transport. The University of Cambridge collaborating with the Centre for Sustainable Road Freight designed an aerodynamic trailer which reduces the fuel consumption and the pollution levels by approximately 7 percent (UK Government, 2017).

On the other side, Asia is also working hard on building strategies for green transportation topics. The Association of Southeast Asian Nations representing approximately a population of 640m inhabitants promoted the concept of green freight and logistics in their Transport Strategic Plan 2016–2025 through the support, training and expertise for the proliferating fuel transportation in SMEs; increasing the dangerous goods transportation security and the promotion of green policies and green freight labeling (TCC, 2017).

Latin America is not an exception about proposing and introducing new concepts that might influence green transport. For example, Brazil is the leader of clean transport in the region since the 1970s, with the launch of the federal initiative “ProAlcool”; promoting the use of sugarcane ethanol for transporting. It has been proved that the use of sugarcane in transport issues lowers GHG emissions quantity than fuels like diesel and gasoline are generating; besides, it is a renewable source (Marchán and Viscidi, 2015).

6.2 Green purchasing

To effectuate an ecological purchase, the following activities must be fulfilled: source reductions through recycling, reutilization, changing and control of them. Another relevant

activity to the green purchasing is supplier development (Burritt *et al.*, 2011) and the resulting products from the purchasing process should be sustainable with the environment (Pazirandeh and Jafari, 2013).

One of the advantages of the green purchasing, also known as green procurement, relies on the waste avoiding, therefore achieving a reduction in environmental costs (Azevedo *et al.*, 2011). Another essential point this GP focuses on obtaining green products since their planning helps in the return of life-ended products for their reprocessing or reutilization (Zhu *et al.*, 2008); hence, the customer cooperation is essential to accomplish the return successfully (Govindan and Soleimani, 2017). Even though green purchasing is crucial for enterprises in order to become eco-friendly and operationally efficient, according to Lo and Shiah (2016) it is still a complex challenge to adopt by organizations due to the time and investment required. Thus, companies behave in a conservative way when concerned with green procurement (Rao and Holt, 2009).

There is a rising interest in countries regarding to the application of green purchasing strategies, specifically in the investment recovery for closing the loop in the SC (Zhu *et al.*, 2008). The EU owns an initiative of Green Public Procurement (GPP) in which public authorities purchase with environmental responsibility for selecting goods, works and services. Inside the public procurement process of the GPP, there must be a clear and reliable green criterion for the existing products and services in the sector. The EU developed a guideline for green purchasing oriented to a circular economy; promoting the identification of circular materials supplying according to the 4Rs principle (EU, 2017).

6.3 Green information technologies

The main objective of these systems is to impact in a positive way in the environmental, economic, organizational and operational performance. Green *et al.* (2012) confirmed the relevance of enforcing green information technologies at the beginning of the implementation of GSCM to grow their efficiency and organizations as well (Gandhi *et al.*, 2015). These technologies may provide the necessary information for the decision making in essential activities such as the green purchasing, the cooperation level with customers and the eco-design.

According to Zheng (2014), the utilization of green IT is a helpful discipline in the CO₂ emission reduction issued by other industrial sectors. In 2008, the IT industry was responsible for at least 2 percent of the CO₂ emissions worldwide. Therefore, green IT across organizations is crucial to obtain benefits in a technologically, organizationally and environmentally perspective.

Another aspect that should be considered within the application of green IT is the material employed for the technological devices known as e-waste, due to the fact most of the manufactured metals are toxic and the use of water consumption in vast quantities (Perkins *et al.*, 2014). Hence, the role of recycling is essential for handling successfully green IT. The German Fraunhofer Institute for Reliability and Microintegration (IZM) contributed in the development of an eco-friendly computer integrated by eco-friendly components which, according to the fabricants, uses 70 percent less power than traditional devices. Once the equipment has been reached its EOL, approximately 98 percent can be recycled (Fraunhofer-Gesellschaft, 2012).

6.4 Reverse logistics

Being a discipline of green logistics and an essential part of GSCM, it consists primarily in the value creation of objects that arrive at the EOL from the consumption to the origin point (Zhu *et al.*, 2008). This discipline emerges for organizations to employ logistics in a way not only they can obtain economic benefits, but also environmental ones though the conservation of the resources previously used (Gandhi *et al.*, 2015).

The reverse logistics contributes in the process alignment with the traditional logistics, integrating IT, improving the relationship between the stakeholders, reducing operational costs and taking advantage either of life-ended products or raw materials. Also, for the identification, designing and improving of processes for the managed products in reverse logistics preparing them for either their reusing, recovering, recycling or disposing, with the main purpose of avoiding the environmental impact and maximizing the economic benefit of the companies (Gómez Montoya, 2010).

Reverse logistics is not a recent activity within the industrial sector, considering that in SC, it performs an important function in regard to close the loop (Zhu *et al.*, 2008); helping as much as possible to the conservation of the resources and even improving the relationship with customers (Bouzon *et al.*, 2014).

On the other side, although it is a significant opportunity for profitability in reverse logistics strategies, but it also have challenges to come through. According to Kanetkar and Dande (2016), these are the main predicaments concerning reverse logistics:

- complexity in evaluating costs;
- lack of consciousness of the impact that the discipline may generate;
- vagueness on the quantity and timing of the products return;
- few policies supporting reverse logistics operations; and
- shortage of investments in technologies for reverse logistics.

7. Closing the loop in Latin America

As previously discussed, there are countries that have invested and established strategies related to GP with the main objective of closing the loop, a term which is extremely related to GSCM and achieved across these practices. However, Latin America is one of the nations with a lack of programs related to the recovering of ended products compared to advanced countries in these topics such as the European and Asiatic ones.

One of the organizations working on this subject is the Energy and Climate Partnership of the Americas (ECPA), assisting companies on boosting their competitiveness and sustainability, by carrying out strategies related to closed-loop cycle production; including design and manufacturing, specifically for SMEs. They focus primarily on three aspects: they promote application of closed-loop methods; analyze and advise stakeholders the economic and environmental benefits to stimulate the appliance and previous aspects supported by the knowledge and awareness increasing through the collaboration with the interested entities such as government and national companies (ECPA, n.d).

According to the World Economic Forum (WEF), in year 2017 five Latin American companies shine for their useful actions directed to close the loop (Lacy, 2017). The paper will explain two of them:

- (1) Sintronics works in the electronic market to back up the Brazilian legislation related to the solid waste, across the transformation of broken equipment in raw materials for being reused. They employ RFID tags and logistic programs based in the cloud, achieving approximately a 97 percent of recycled material to return to the SC.
- (2) The Brazilian company New Hope EcoTech is mainly dedicated to close the loop through a platform which connects the informal waste collectors and the most polluting manufacturers, being engaged to handle and recycle the packaging for materials. They support to more than a quarter of Brazilians depending on the waste collection market across the utilization of “recycling certificates” to control their waste footprint.

8. Conclusions and future work

Based in the previous reviews and analysis, it can be concluded that GSCM is more than a concept which will get more attention throughout the years, being more a necessity than an alternative in the traditional SC evolution. Factors such as the nature conservation, the protection of the economic and social well-being as well as the sustainable future for the humanity impulses the adoption of the green culture and GSCM.

The GP evaluated on this paper demonstrated that although they focus on different activities within the SC must be employed integrally; such as green logistics, green transport and reverse logistics. Therefore, the direct relationship between GSCM and GP is confirmed, and every organization should be aware of this.

Green purchasing is a critical activity for obtaining a sustainable product and must be done since its creation from the raw material acquisition that fulfills green standards to the design of the product itself for apply the 4R principle at its EOL (Hu *et al.*, 2011). Besides, supplier development and collaboration are key factors for achieving an ecological and profitable operation (Teixeira *et al.*, 2016).

On the other hand, green IT is a key concept for reaching the improvement within the organizations performance. Currently, due to the significant economic investment needed for the acquisition of systems that might control the CO₂ emissions or other pollutant agents, it is being adopted only by big companies; however, there is a remarkable trend in which technology will be accessible also for SMEs, being easier for this kind of organizations to embrace.

The review also wrapped up that GP and the implementation of GSCM brings benefits in cost savings (Lee, 2009) building a positive reputation with the customer and the stakeholders, and the enhancing of the green culture within the organizations, being responsible simultaneously with the environment. Nonetheless, another point in where most researchers agreed is the role and collaboration of stakeholders on adopting GP.

Without question, is a fact that either GP or GSCM must be supported by a solid legislation package launched by the government and related authorities. Furthermore, even though companies might be enthusiastic for going in a transition to a green company, the motivation provided by economic incentives and environmental benefits to pursue is essential for a successful transition to GSCM.

Fortunately, there is a growing interest from emerging economies on its adoption. European and Asian countries have been involved heavily in the creation of green strategies relevant to the SC proving that one of the most crucial factors to build a successful GSCM is the participation and legislation from the correspondent authorities; principally the government, public and private institutions. On the other hand, even though in Latin America there is a rising attention in these subjects, a lot of work must be done to achieve similar levels compared to the nations previously mentioned.

About answering the questions provided in the paper introduction, it can be concluded that there is an impact to the environment generated from the companies SC. Undoubtedly, environmental costs emerge from the actions made by them, and in most of the cases, the hidden costs are paid by the environment.

Despite the fact there are plenty of investigations published associated to the impact of GP around the world, further case studies research works should be conducted through the evaluation and implementation of GP within organizations; with a previous diagnosis of the company through a wide examination of its current activities to identify which GP might be useful for improve their operational performance and, therefore, the economical one.

For last, looking at the future in the investigation, there is a widespread scope in Latin America for closing the loop through the SC; either for companies to apply novel strategies or the academy to keep on investigating its further effects; and how may these boost the transition to a circular economy.

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