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The Mediation Effectiveness of Green Supply Chain Management Practices Toward Sustainable Development in Algerian Construction Industry

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Abstract

Sustainable construction involves the creation of buildings using best-practice cleansing and resource-saving technologies from the extraction of raw materials to the removal and disposal of their components. Construction activities always involves some adverse environmental impacts, although sustainable construction should reduce it to a certain degree. Management scholars researched organizational environmental practices in 1990s and advocated more holistic and responsible practices in the supply chain. The aim of the study is to improve the use of green supply chain in construction industry sector in Algeria. Firms that are targeted in this study are Suppliers, Managers and Contractors in Algeria. Supply Chain Management (SCM) is still in its infancy in the construction industry, but some philosophical awareness is evident. Suppliers, contractors and subcontractors are not integrated, they lack teamwork and they are not team-oriented. GSCM can play an important role in architecture. The adoption of GSCM provides general guidelines for

analyzing, redesigning, and coordinating the entire supply chain of the building and continuous improvement, solving basic problems and controlling short-sighted supply chains. This paper has proposed a conceptual framework for this study by exiting all these saturated areas into the construction industry sector with attention to the intensity of implementation of green supply chain management in the construction industry sector in Algeria.

Key Words; Sustainable construction, green supply chain management, Algerian Construction

1. INTRODUCTION

The term of "supply chain" or "logistics network" is defined as a system of organizations, people, technologies, activities, information, and resources involved in moving a product or service from the supplier to the customer. Further definition of supply chain has been defined as "the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer" (Mohd Nawi & Lee, 2016).

The term Supply Chain Management (SCM) began in the 1980s and aims to express the need to integrate key business processes from end users to original suppliers. In general, SCM terminology reflects the process of planning, implementing, and controlling supply chain operations as efficiently as possible. Supply Chain Management spans raw materials, WIP inventory and all movement and storage of finished products from the origin to the point of consumption (Mohd Nawi & Lee, 2016).

2. CONCEPT OF GREEN SUPPLY CHAIN MANAGEMENT

Green supply chain can be defined different ways depending on the investigator. Stivastasta in 2007 defines GSCM that integrates environmental thinking into supply chain management, including product design, material procurement and selection, and delivery of production processes after the end product's lifetime. Another definition by Ojo *et al* (2015) GSCM's scope extends from procurement to reverse logistics throughout the so-called closed-loop supply chain. (Bai et al.,2017) described GSCM as procurement organization plans and activities that integrate environmental issues into supply chain management to improve the environmental performance of suppliers and customers.

Green supply chain management (GSCM) integrates environmental thinking into supply chain management, it includes extensive stages from designing a product, material sourcing and selection, manufacturing processes, product delivery, and end of life management of the product. Supply chain management has the potential to make construction projects less fragmented, improve project quality, reduce project duration, and hence reduce the overall total project cost, while creating more satisfied customers. The green supply chain management (GSCM) has emerged as an effective management tool and philosophy for proactive and leading construction organizations (Ojo *et al*., 2014).

The main activities involved in GSCM are green design, green purchasing, green manufacturing, green transportation and reverse logistics (Sharma *et al*., 2017). Green design is an approach to design the product with enhanced biological quality by reducing its adverse impact on the environment throughout its life cycle. It involves taking account of the environment during a products design phase (Sharma *et al*., 2017). According to (Nejati, *et al*, 2017) Green supply chain management allows an organization to achieve its economic goals, reduce environmental risks, minimize. Its adverse environmental impacts, and improve the ecological efficiency of the organization and its associates throughout the supply chain. Green supply chain management (GSCM) has emerged as a cutting-edge approach to balance the organizational economic, social, and environmental requirements. In Malaysia, the construction industry plays a very important role to provide adequate, quality, and affordable homes, facilities, and infrastructures as part of the development of the country (Mohd Nawi *et al*., 2016).

Similar to the concept of supply chain management, the boundary of GSCM is dependent on the goal of the investigator. Supply chain management has the potential to make construction projects less fragmented, improve project quality, reduce project duration, and hence reduce the overall total project cost, while creating more satisfied customers (Asghar *et al* , 2013). The sustainable construction should include 'cradle to grave' appraisal, not only in the serviceability of a building during its lifetime, but also the recycling of resources to reduce waste stream associated with the after use. Responsively, the GSCM literature has grown considerably over the last decade (Vanalle *et al*, 2017).

However, construction usually has a significant and irreversible impact on the environment impacts such as the massive use of natural resources, pollution of the environment, and high energy consumption are among the whole supply chain from production of construction materials to the end user (CIEC, 1992). With the increasing need for environmental awareness, the term 'sustainable construction' is becoming popular.

Theory and empirical research to date has explored the implementation and effects of such practices as eco-design, cleaner production, environmental purchasing, and green/reverse logistics, on selected performance outcomes, using financial, operational and environmental measures (Mbohwa, *et al*., 2014) . It has become a popular and notable concept in sustainable construction because it largely takes environmental elements into consideration. Others, such as Mbohwa *et al* (2014) defined Green or sustainable supply chain management as a strategic, transparent, integration and achievement of an organization's social, environmental, and economic objectives in the systemic coordination of key inter organizational business processes for improving the long-term performance of the firm and its supply chain partners.

Sustainable Development

sustainable development refers to the dynamic state that arises when the company develops the value of continuing shareholders and stakeholders. Our results prove that disclosure of the dimensions of sustainable development as a whole has a positive impact on the quality of financial reports in commercial banks in Iraq (Abdullah et al., 2021). There is a high role for adopting the method of strategic auditing through (auditing stakeholders) to improve the quality of auditing (Karim et al., 2020).

A key aspect of sustainable value is that by serving society and the environment, the company better serves its customers and shareholders rather than without it. Sustainable development as mentioned by (Hassan *et al*., 2016) in his book 'Conceptualizing Sustainability: The Business Opportunity' These activities help to extend the company's useful life, strengthen the earth's maintenance, update the biosphere, protect organisms, improve society's ability to maintain itself, solve problems and maintain the sustainability of welfare, and human participation and personal freedom in the present and future. Sustainable development requires companies to take into account both the social and environmental consequences within their operations and their daily activities. Sustainability is currently a common preoccupation on both national and international level.

The deciding issue of sustainability is the opposition between the population's need to grow on one side and the planet's resources and the continuous degradation of the environment on the other side. Sustainable development requires companies to take into account both the social and environmental consequences within their operations and their daily activities. The Algerian government invests heavily in sustainable development and scientific research, new laws on sustainable housing, reducing CO2 emissions. Shows the interest of the Algerian state to promote sustainable development other the legislative side, the national scientific research encourages researchers to engage in research that is the case of PNR projects and achieving the pilot projects, the organization of international meeting to develop new concepts (Trirat *et al.,* 2017).

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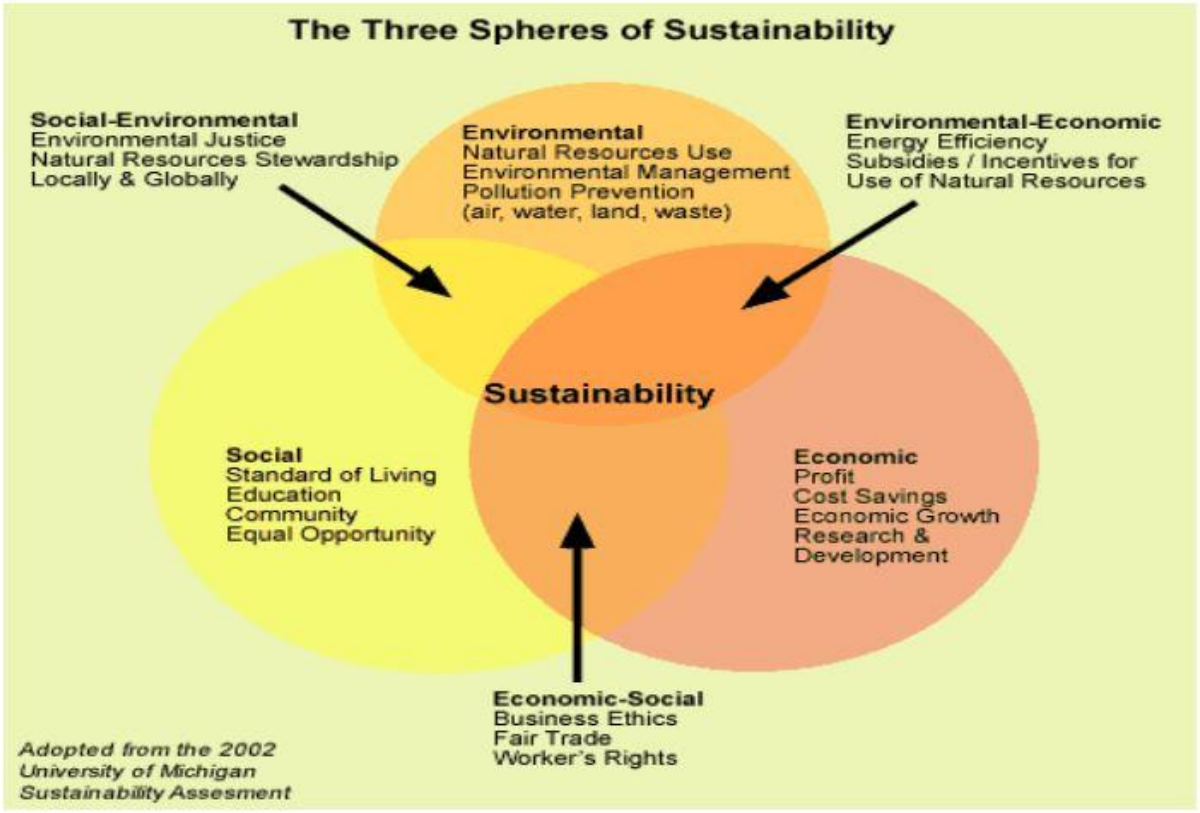


Figure 1 Principals of Sustainable Development
(Adapted: 2002 University of Michigan Sustainability Assessment)

Goals of Sustainable Development

A study by (Campagna *et al*,. 2015) stated that Sustainable Development have three goals as following:

Environment: reduces water use, reduce net land distance, and reduce net emissions.

Social: improve equal employment opportunities, improve contribution to community capacity building, and reduce impact on heritage.

Economic: optimize long-term economic value.

Some researchers have suggested some benefits of using sustainable buildings, including: Shortening construction time, reducing overall construction costs, improving quality, increasing durability, improving the appearance of a building, improving occupational safety and health, saving materials, reducing environmental impact Waste at a construction site and reduced emissions to the environment, reduced energy and water consumption(Shah *et al* ,. 2017).

Green Building - the basis for sustainable construction. The high contribution of the construction industry has unquestionably influenced the gross domestic product economically. Although green buildings bring a variety of benefits to society, the development of green buildings in developing countries, including Malaysia, faces several market barriers. (Ojo *et al* ,. 2015).

Green buildings and the separate design of old buildings do not solve the global environmental problems. This does not lead to energy independence or a decline in electricity bills. However, as the world wants to adapt to climate change, this is one of the key areas we will pay more attention to (Tushar et al.,2016). Currently, the simple accumulation of green technologies may mislead the building as "green," even though it is actually pseudo green (Liu et al., 2016). Construction and engineering firms were encouraged to look at project management from a process as well as a practical point of view in order to meet environmental requirements. (Ojo et al., 2015).

Today, more than ever, the issue of sustainable development is at the forefront of how communities have been thinking about growth and the responsibility of government to create ways to accommodate growth while decreasing the carbon footprint of human habitation. The concept of 'green building,' i.e., the practice of using resources more efficiently while creating healthier and more energy efficient buildings (Asrawi et al., 2017).

The Green Building can be smart hostel that employ platelets electro-optical in electric power generation, and retrieval systematically in water heating, instead of leaving it to evaporate into the air, as the system can Electro-Optical to produce 70 % of the hot houses and other buildings, healthy water and thus prevent the continued wastage of billions of cubic meters of water in a few years all that posed the risk of a water shortage in the country ()**.** This is what urges Algeria to become more involves in investments linked to sustainable development, especially at the present time.

Sustainable Supply Chain Management Practices

From the researches on logistics social responsibility (LSR), procurement, transport, packaging, storage and reverse logistics processes were examined, this showed that LSR was divided into six thematic areas: environment, ethics, diversity, working conditions, human rights and security. Subsequently, in the context of sustainable supply chain practices, such as environmental procurement, other studies have linked traditional procurement activities with an element of environmental management. Focus on sustainable transport, definition as transport that meets the needs of mobility, the maintenance and improvement of human health and ecosystems, economic progress and social justice for the present and the future (Zailani et al,, 2012).

Sustainable warehousing, which includes activities such as terminal and warehouse location, proper storage and disposal of hazardous materials, surrender of surplus or outdated inventory to local communities, and training in safe forklift operation. Sustainable packaging is defined as packaging that adds real value to society, effectively protects and protects products as it moves along the supply chain. Consists of materials that are constantly recycled and pose no threat to human health or ecosystems. Another sustainable approach in the supply chain is reverse logistics, which defines the supply chain as a system that includes purchasing and logistics at inbound, production and distribution (outbound logistics and marketing), and reverse logistics. Based on the above definition, procurement at the beginning of the value chain and inbound activities plays a key role in determining the environmental impact and the high acceptance of corporate environmental procurement.

A- Environmental Purchasing

In addition to the traditional sourcing criteria, which focus only on cost, quality and delivery, environmental sourcing deals with sustainability in sourcing resources. According to Kazancoglu *et al*., (2018) and Zailani *et al*., (2012) , the following are based on a summary of the literature on green purchasing activities between the buyer and supplier:

- Product content requirements: buyers specify that purchased products must have desirable green attributes, such as recycled or reusable items.
- Product content restrictions: buyers specify that purchased products must not contain environmentally undesirable attributes, such as lead, CFCs, plastic foam in packaging materials.
- Product content labeling or disclosure: disclosure of the environmental or safety attributes of purchased product content.
- Supplier questionnaires: asking suppliers to provide information about their environmental aspects, activities and/or management systems.
- Supplier environmental managem- -ent systems: requesting sup- pliers to develop and maintain an environmental management system (EMS) though buyer does not require supplier to certify the system.
- Supplier certification: buyers require suppliers to have an EMS that is certified as fully compliant with one of the recognized international standards, such as ISO 14001 from the International Organization for Standardization (ISO), and the European Union Eco-Management and Audit Scheme (EMAS).
- Supplier compliance auditing: buyers audit suppliers to determine their level of compliance with environmental requirements.

B- Sustainable Packaging

Zailani *et al*., (2012) described This packaging directly contributes to the product's success in the supply chain, ensuring efficient product distribution and reducing the impact of product damage and waste on the environment. Packaging, however, affects the environment, which is not sustainable in the long term, e.g. These include, for example, the consumption of non-renewable resources, the generation of emissions into the atmosphere during manufacture, transport and use, and the production of solid waste that must be disposed of in a landfill. According to (Zailani et al., 2012), the benefits of sustainable packaging may be obvious from an environmental point of view. B. Reduction of waste and conservation of resources as well as economic and social benefits.

(Seuring & Müller, 2008) argued that, typically, when goods pass through the supply chain of production, the associated packaging waste is often a neglected or ignored by-product, which is poorly processed and ultimately leads to waste, poor processing and unnecessary waste at a landfill. These phenomena are exacerbated by poor connectivity and lack of responsibility of supply chain partners, which limits the potential for improved packaging solutions that can simultaneously meet the functional requirements of the supply chain environment and reduce the environmental and supply chain costs. According to (Jaakkola, E. et al., 2015), packaging plays an important role in a large integrated system involving many stakeholders along the

entire supply chain, including material handling, logistical input, procurement, manufacturing, warehousing.

3. TRADITIONAL SUPPLY CHAIN MANAGEMENT

Supply chain is defined and interpreted within the literature by several authors.*(Ivascu et al* ,. 2015*)*, define the supply chain as a Network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. (Chin, Tat, & Sulaiman, 2015) emphasize that the supply chain consists of all steps that directly or indirectly participate in the execution of a customer request. The supply chain includes not only manufacturers and suppliers, but also freight forwarders, warehouses, retailers and customers.

Green Supply Chain Management has already won an increased interest within researchers and companies (Ojo *et al*., (2015); Dou *et al*., (2017); Zhu *et al*., (2017). The growing importance of this concept is mainly due to environmental degradation, inefficient waste management and reduction of raw materials. The addition of the term green to the supply chain implies the approach to the supply chain from a traditional perspective by confirming or combining the natural environment. (Zhu et al., 2017) notes that GSCM can be considered an environmental innovation. (Dubey et al., 2015) emphasize that GSCM ranges from green procurement to integrated supply chains that span from supplier through manufacturer to customer and reverse logistics and close the loop. (Laari, Töyli, & Ojala, 2017) said that GSCM can be defined as integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing process, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life.

4. GREEN SUPPLY CHAIN MANAGEMENT

Green Supply Chain (GSC), also known as the Ecofriendly Supply Chain (ECSC) or the Green Supply Chain (ESC), which has its roots in environmental management and supply chain literature. Add the green. Green Supply Chain Management provides a strategic overview of sustainable supply chain management and sheds light on the theoretical foundations and basic principles of this topic. In particular, this book covers a variety of topics, including the benefits and implications of green supply chain management. Incentives and barriers to the supply chain; Considerations on incoming and outgoing logistics; Production, packaging and reverse logistics in accordance with the term greening of the supply chain management component include consideration of the influence and relationship between the SC management and the natural environment.

Green Supply Chain Management (GSCM) has become an effective management tool and philosophy for proactive and leading construction companies (E.M.Ojo et al., 2015). Sustainable construction is an area in which construction companies understand the needs of today's generations in today's competitive environment and offer them effective and efficient solutions that achieve their goals without compromising the new generations' ability to meet their own needs (Udin et al., 2015)). In response to growing global environmental awareness,

Green Supply Chain Management (GSCM) has emerged as a concept that incorporates sustainability elements and a combination of environmental thinking within the internal and internal supply chain management before and after the company. (Mani, Gunasekaran, & Delgado, 2018).

GSCM covers the environment-friendly purchasing and purchasing, the environment-friendly production and materials management, the environmentally friendly packaging, the environmentally friendly distribution and marketing as well as the reverse logistics. (Nejati et al., 2017). Sustainable supply chain management enables a business to achieve its economic goals, reduce environmental risks, minimize negative environmental impacts and increase the environmental performance of the company and its partners throughout the supply chain (Dubey et al., 2015). GSCM is a way to minimize the risk of potential losses associated with poor environmental performance. For example, environmental incidents can increase regulatory pressure.(Laari *et al*., 2017).

GSCM activities can be attributed to the support of the management, the environmental policy of the organization, the environmental design, while the latter are better suited for green procurement, reverse logistics and customer relations to meet environmental needs and research and development in cooperation with interested parties perform. Parties and ratings and selected suppliers. To achieve better environmental performance and efficiency, three main methods of GSCM must be implemented. (Chin Wei *et al* ,. 2009).

A- Green Purchasing

Sustainable Procurement is considered to be an environmental procurement approach designed to ensure that purchased goods meet the company's environmental goals, including minimizing or eliminating hazardous compounds, minimizing the source of waste, and conducting recycling and acquisitions. Green purchasing also means that the purchasing manager, when purchasing resources, takes into account the sustainability as well as the cost, quality and delivery of goods (Lu et al., 2015). Purchasing materials in the construction industry is an important supply chain management process.

According to (Ivascu et al., 2015) a review of a set of green procurement strategies that includes four key attributes that should be included in GSCM. Most companies have discovered that implementing green supply chain management not only benefits the environment, but also improves product quality, increases productivity, and reduces the risk of disrupting the supply chain or reputation.

B- Eco-Design

In short, eco-design or eco-design refers to measures used in product development to reduce the environmental impact of products. This includes the purchase of materials, manufacture, use and final disposal. Ecodesign takes into account other important product standards such as performance and costs. Ecodesign is considered one of the best initiatives in the supply chain that integrates a supply chain environment into product design. This applies to product supply chains.

C- **Reverse Logistics**

Reverse Logistics consists primarily of the recovery, recycling, reuse, recovery, repair or disposal of products and materials in relation to supply chain consumption. The basic logistics operations for transportation and inventory management are also included in reverse logistics, although this mainly concerns products provided by customers rather than customers.

Reverse Logistics in the strict sense is an attempt by a company to return and return a product whose lifecycle has been completed, rather than dumping it in a landfill. These efforts include the recycling and recycling of collected products and their packaging, as well as the use of information and communication technologies (such as radio frequency identification) to track products that have been used throughout their lifecycle. It does not consider the impact of advanced logistics on the environment, such as impact of carbon footprint on vehicle emissions in outbound campaigns, as most of the company's environmental initiatives / policies focus on reverse logistics activities (Choi, 2018, Teixeira et al (2016), Laari et al., 2017) Another reason lies in the nature of reverse logistics, especially a hundred times through the collection of waste or defective product life cycles, processing (raw materials or raw parts).

D- Green Manufacturing

Green production is known as a company's ability to order products based on each customer's specific needs, timing, and needs (Choi (2018); Schrettle et al. (2013)). It also shows how much of the company's total resources (total production capacity) is fully utilized at a given time (Zhu et al. (2017); Choi, (2018)). Product recall, safety stock and quantity of goods exchanged in exchange for defects). Environmental practices can help companies make more efficient use of their material resources by recycling some usable materials to reduce material waste.

E- Green Marketing

Green marketing is referred to as the company's interest in eco-friendly products, and customers believe that these products have a higher value than their alternatives. (Teixeira et al., (2016);Choi, (2018)). In other words, customers see the company's green products as more expensive products, making them more satisfied with those products. Growing customer satisfaction and rising customer value are expected to bolster the company's position in the marketplace and subsequently increase brand image, market share and revenue.

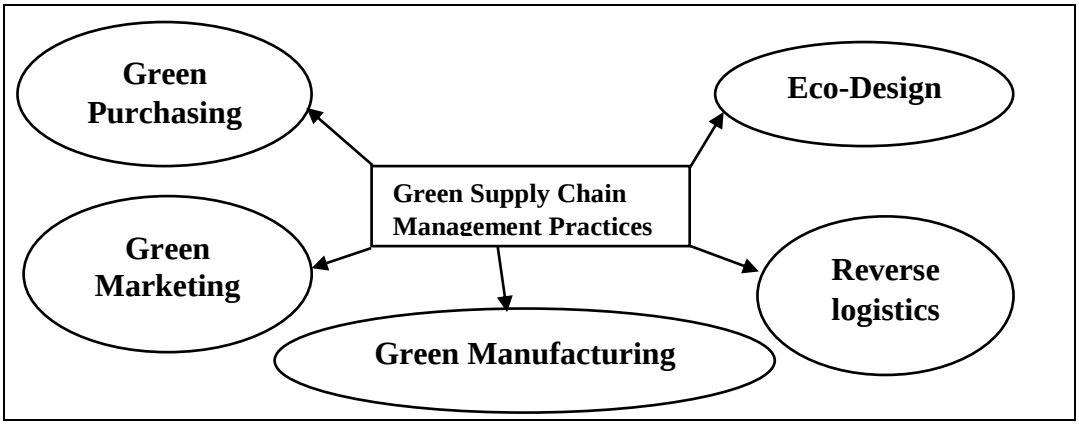
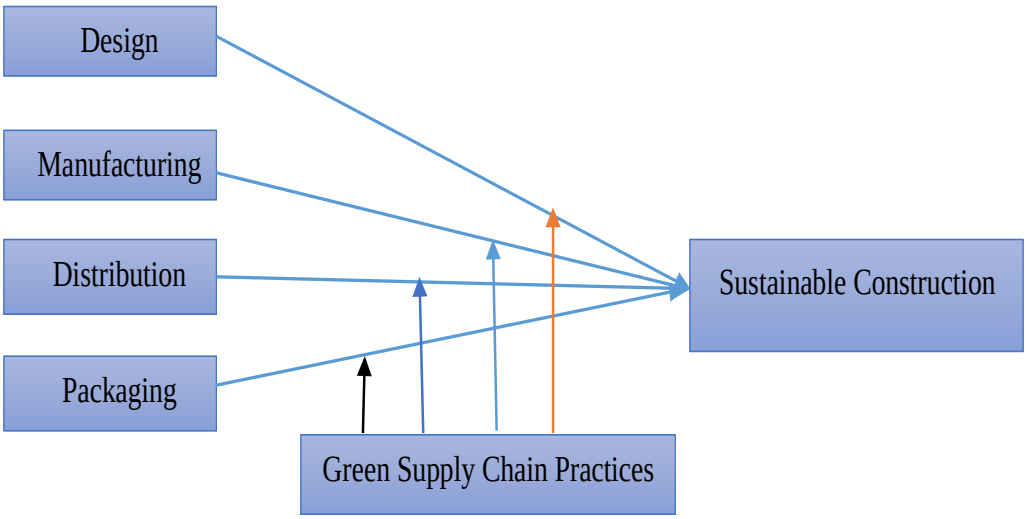


Figure 2 Principle Green Supply Chain Management Activities (Researcher, 2020)

This paper develops a conceptual framework that would be used for a study intended to be carried out in the future on the effects of green supply chain management in Algerian construction industry. The framework shows the flow and the direction of the relationship among the postulated variables of the study. Figure 3 shows the conceptual model of the intended study.

The conceptual framework as shown below will be used in this research to show the relationship between the variables in the study. Green Supply Chain Management as a mediator contained five dimensions namely; Eco Design, Green Manufacturing, Green Distribution, Green Purchasing and Reverse Logistics. The mediator will help the traditional supply chain management which is independent variables in this study towards the dependent variable is the Sustainable construction. In additional the present study proposed the Green Supply Chain Management practices to be integrated into the traditional supply chain order to enhance the construction industry in Algeria.



Independent Variables Moderating Variables Dependent Variables

Figure 3 Conceptual framework proposed for this research (Researcher, 2020)

Outcomes of GSCM in construction industry

Pigosso *et al*. (2013) pointed out that Eco-Design is a proactive approach to environmental management that integrates environmental aspects into product development and related processes such as manufacturing, marketing and procurement. According to Zhu et al. (2008), environmental design should at the same time take into account the function of the product and minimize the impact of its life cycle on the environment. Studies have shown that 80% of a product's cost and environmental impact is determined by product specifications, packaging and market positioning during the design phase.

Therefore, the design phase is a mechanism to obtain an effective product with reasonable price and reasonable environmental impact. Green purchasing practices take into account the increased cost of materials and a limited number of qualified suppliers due to the demand for differentiated materials and components. Relations between manufacturers and suppliers should be improved in the search for environmental solutions.

The practice of Green Manufacturing and remanufacturing, many companies install equipment based on their projects and good working conditions. These companies perform preventative and preventive maintenance with a focus on product performance and extend their useful life, dismantle the finished product for further processing and / or reuse, recycle defective materials or components, and / or recycle during production. Use.

Green Distribution refers to advertising or product advertising, changes in the production process or changes in the packaging, weighted according to environmental standards. Green Marketing supports a green lifestyle and takes into account the relationship between products / services and the environment. Eco-friendly distribution is an important part of GSCM as it can have a very positive environmental impact. Revers Logistics is the activity for starting and designing, practicing and managing building objects and material flows. It includes information flows that effectively manage construction waste based on important technical and legal criteria (Sobotka & Czaja, 2015). Wood is used in the construction industry because building materials require the selection of elements suitable for subsequent processing, destructive testing and mycological analysis. (Sobotka, Sagan, Baranowska & Mazur, 2017)**.**

Justification for the Study

However, these are not defects without the most important defects.

1) The complexity of the design is based on the wishes of the customer, the change of the customer's wishes, the discussion of the lengthy change process and the interaction with other participants during the presentation and the design.

2) Logistics: large quantities, improper packaging, bad weather or political circumstances, long shelf life.

3) Distribution not according to planning late deliveries of permanent materials, wrong and defective deliveries, large shipments, long storage period, interfaces with several subcontractors and suppliers, poor training of contractor’s suppliers, subcontractors and workers, inadequate management within the supply chain, mainly poor.

4) Complete the project and complete the project. Debug interface: Problems occur in the local community due to quality or security issues. Unresolved quality and technical issues that delay the completion of work delays. Supplier and procurement interface: inaccurate

data, unfulfilled technical specifications, other changes, lack of coordination between suppliers, cooperation and commitment, inferior materials and components.

5) Waste management practices are not yet fully implemented as they are not closely related to existing legislation on waste management, treatment and disposal. The company has always strived to minimize waste disposal and damage other practices (Fares D, 2018

6)). Current supply chain management practice indicates that supply chain control generates value for integrated flow, not just a series of discrete activities. For the general problem model during construction, the term supply chain refers to the stage at which building materials actually pass before they become a permanent part of the project. In the light of what has been mentioned in previous studies and the result of the implementation of supply chain in the construction sector in Algeria and its benefits, it lacks some practices that proved the green supply chain in the impact on the environment that produced exciting benefits in developed countries, Environmentally friendly production Therefore, the construction of Algeria needs to be improved more by GSCM implementation, which will be particularly beneficial to the economy, society and the environment

5. CONCLUSION

GSCM activities can be attributed to top management support, organizational environmental policy, investment recovery and green ecological design, while the latter is more adapted to green procurement, reverse logistics and customer relationships to meet green needs, conduct research and development cooperation with stakeholders and evaluate and select suppliers. Basically, in order to achieve better environmental sustainability and performance in Algeria, the three major GSCM basic practices must be implemented. The suggested framework will help future employers, designers, manufacturers, contractors and suppliers in the use of green supply chain management towards sustainable construction in Algeria.

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