



# Factors Affecting the Development of a Green Supply Chain Management in UAE

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## ARTICLE INFO

### Keywords

Factor – Development – Green – Supply Chain Management

### Article history

**Received:** 25 November 2021

**Accepted:** 17 March 2022

## ABSTRACT

The term green supply chain management mainly refers to those concepts which integrate the sustainable environmental processes into the outmoded supply chain. This process can include product design, manufacturing, production, material sourcing, and end of life management. According to this definition, GSCM refers to a wide range of products from product design by recycling or destroy. In this process, the products are passed through a cycle of life. For example, as same as human beings, they also pass through the cycle of life such as birth, maturity, and death. The product life cycle involves a degree of structure to the life of products, which provide the directions for the functional efforts to produce and deliver the product. The main question in this research is “what are the effective factors in the implementation of the green supply chaining of construction projects and what are their priorities?” In this study will define key internal operational influences influencing the management of the Green Supply Chain through an analysis of its literature and a compilation of expert opinions. In this paper, the network analysis process method was used to prioritize the factors affecting the green supply chain in the UAE. The results showed that external factors, binding factors, internal factors and management factors affect the promotion of green supply chain system, respectively. And can have a positive impact on pollution reduction, economic development, social development, quality development and social capital.

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## 1 Introduction

In managerial methods and techniques, supply chain management is viewed as a critical issue [1]. Wang [2] indicated that the integration of internal operational decisions with external factors is known as supply chain management. While, according to Gilbert [3], Green Supply Chain Management integrates all supply chain management activities when recognizing their environmental effects. According to Naini et al [4] the implementation of green supply chain management practices allows companies to reduce environmental risks and maximize the use of

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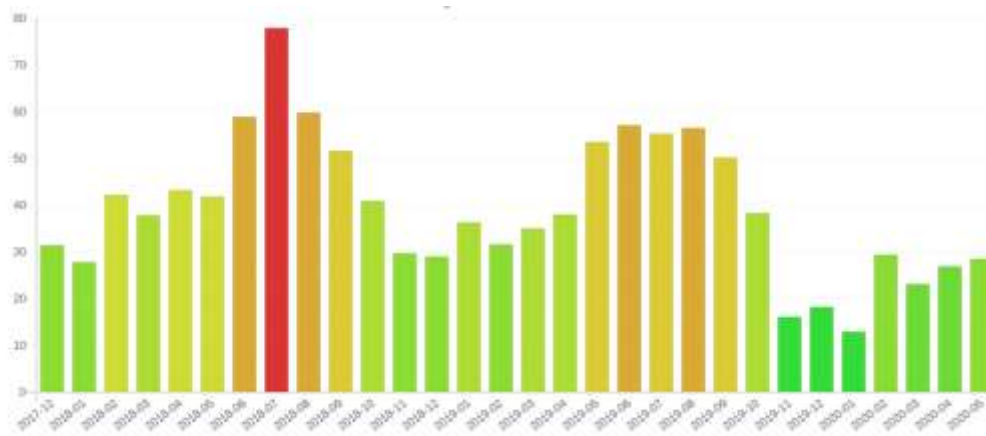
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resources and electricity. However, several authors have recognized various critical factors of green supply chain management briefly defined below [2].

Green Supply Chain Management has emerged as a significant approach that can lead to improving sustainable efficiency due to increased environmental demands and the need for economic well-being [4]. It becomes important for an organization to carry out the green supply chain management activities successfully and to boost its environmental profile with the increase in environmental constraints [5]. Companies may choose from a wide range of vendors and eliminate the environmental effects of supply chain operations by using green supply chain management procedures. Therefore, it is important to consider new possibilities that aid against competition and to integrate new principles into the company [3]. Grimm [6] indicated that There are many problems in applying green supply chain management activities. It will be necessary to effectively examine activities to resolve the environmental performance of vendors according to the unique needs of each national and regional context. Unfortunately, research on this subject is only in its early stages. In different industries has been researched and implemented. It will be necessary to effectively examine activities to resolve the environmental performance of vendors according to the unique needs of each national and regional context. Unfortunately, research on this subject is only in its early stages [6].

United Arab Emirates, otherwise known as the UAE or more simply Emirates, is a country located in the eastern side of the Arabian Peninsula. It shares borders with other countries such as Saudi Arabia and Oman, as well as facing onto the Gulf. In regard to its levels of pollution, Emirates came in with a countrywide reading of  $38.94 \mu\text{g}/\text{m}^3$  in 2019, in regard to its levels of PM<sub>2.5</sub> in the air. Emirates 2019 reading of  $38.94 \mu\text{g}/\text{m}^3$  placed it into 12th place out of all countries ranked worldwide, coming in just behind China and Iraq. Among the more common causes of pollution would be the ever present factor of vehicular emissions, particularly prominent in cities such as Dubai where personal vehicles are crucial for day to day life to navigate the city, with vehicle ownership and their emissions staying consistently high (although of note that over the 2020 lockdown period, significant improvements were seen in pollution levels with the widescale movement restrictions taking place, showing just how much of an effect human movement and subsequent pollute output has on the environment). Other main causes of pollution are industrial sites, with numerous factories and processing plants dotting the different cities across the country, many of which would run off of fossil fuels such as coal or diesel (along

with many heavy duty vehicles such as lorries, trucks and buses also running off diesel, contributing further to pollution levels). Figure (1) shows the graph of environmental pollution in the UAE from existing industries:



**Figure 1.** Air pollution in United Arab Emirates from December 2017 to May 2020

Given the level of pollution in the UAE, all industries need to move towards establishing green supply chain mechanisms with appropriate targeting. This study looks at the green initiatives and factors among construction company in UAE that triggered such initiatives. UAE's construction section has been a major contributor to the economy of UAE. According to Statista report, in 2019, construction contributed about 86 billion United Arab Emirates dirhams to the preliminary estimated value of the gross domestic product (GDP) of the emirate of Abu Dhabi. The total estimated GDP of the emirate for that year was about 915 billion dirhams. Considering the level of pollution in the UAE and the development of the construction industry, it is necessary to identify the factors affecting the development of the green supply chain in this industry in order to moderate air pollution and prioritize it for effective policy.

## 2 Literature Review

### 2.1 Supply Chain Management

Much has changed in the landscape of supply chain management research since IMM's establishment in 1971, especially in the fields of operations, sourcing and supply management, distribution, and supply chain management. In 1985, the term supply chain management was first

used in academic literature used by Houlihan [7]. In 1997, the term supply chain management first appeared in the title of an article in IMM[8], and has appeared in the title of an article 72 times in 2017, The SCM terminology gradually gained popularity in the 1990s, until it became commonplace, despite many name changes and meanings proposed over time [9].

When the term supply chain management (SCM) became mainstream, it was claimed by other functional areas as "part of their realm." Operations management (OM) is one of these areas, and it has existed in some way for as long as there have been businesses making goods and delivering services. Since supply chain management connects those that have all of the services needed to produce products, OM has long dealt with problems that are part of SCM, so it has adopted SCM as a jurisdiction, or a subfield, of its [10]. Members of the Academy of Management Operations Management division were also discussing in 2016 whether the group's name should be changed from Operations Management to Operations and Supply Chain Management, as SCM was included in OM. Prior to 1998, logistics believed that SCM was a part of its jurisdiction, and that the two words were interchangeable.

## 2.2 Green Supply Chain Management

Green Supply Chain Management has emerged as a significant tool for enhancing sustainable efficiency as a result of increased environmental demands and a demand for economic well-being [11]. The aim of GSCM is to incorporate environmental considerations into supply chain [5]. With the growing number of environmental restrictions, it is more important than ever for an organization to effectively implement GSCM activities and enhance its environmental profile [12]. In reality, by using GSCM methods, enterprises can choose from a wide range of vendors while also reducing the environmental effect of supply chain operations. As a result, fresh opportunities for overcoming competition and incorporating new principles into the market must be investigated [13]. However, as Grim [15] points out, applying GSCM procedures is rife with obstacles. It will be helpful to look at best practices for coping with suppliers' environmental output depending on the needs of each national and international context. Unfortunately, research on this subject is only in its early stages. According to literature reviews and company surveys, three key dimensions are established that lead to GSCM practices: 1) corporate involvement; 2) supplier selection; and eco-design [14]. The measurements are further subdivided into the aspects that influence them: 1) senior management commitment; 2) Mid-level managers'

dedication; 3) cross-functional businesses' change; 4) ISO 14001 certification; 5) control of environmental standards; 6) collaboration with vendors, 7) audit of suppliers, 8) ISO 14000 certification; 9) environmental friendly second-tier suppliers, 10) reduced material/energy consumption, 11) reuse/recycle of material; and 12) recycle of waste heat.

### **2.3 Critical Factors of Green Supply Chain Management**

SCM (supply chain management) is an important term in managerial techniques [12]. Supply chain management, according to Li and Wang [10], is the combination of internal corporate decisions with external considerations. Green Supply Chain Management (GSCM), on the other hand, according to Gilbert [11], implements all SCM activities thus taking into account their environmental effects. According to Naini et al. [4], GSCM activities assist organisations in reducing environmental risks and optimizing resource and energy use. However, several authors have reported several important GSCM variables, which are briefly listed below [13].

Lamming and Hampson [12] discussed the use of certain good practices such as lifecycle management analysis (LCA), waste management, and food stewardship, among others, in order to develop an environmentally responsible approach with manufacturers and to help in progress. Unlike Lamming and Hampson, Lippmann [6] proposes a range of practices and actions that a business should take to increase its environmental efficiency (such as written GSCM policies, supplier meetings, senior-level leadership, cross-functional cooperation, evaluation of suppliers and having supportive relations with both customers and suppliers).

Fai Pun [13], for example, divides good practices into three categories: policy, product/process, and performance assessment. His findings show that top-level management assistance is the most critical aspect in ensuring environmentally sustainable activities. Bowe et al. [14] distinguish three types of green supply chains A greening process that takes into account provider partnerships and recycling; A green supply focused on materials that requires waste treatment; and advanced green supply, which involves practices such as customer performance measurement, joint clean energy projects with vendors, and environmental risk sharing.

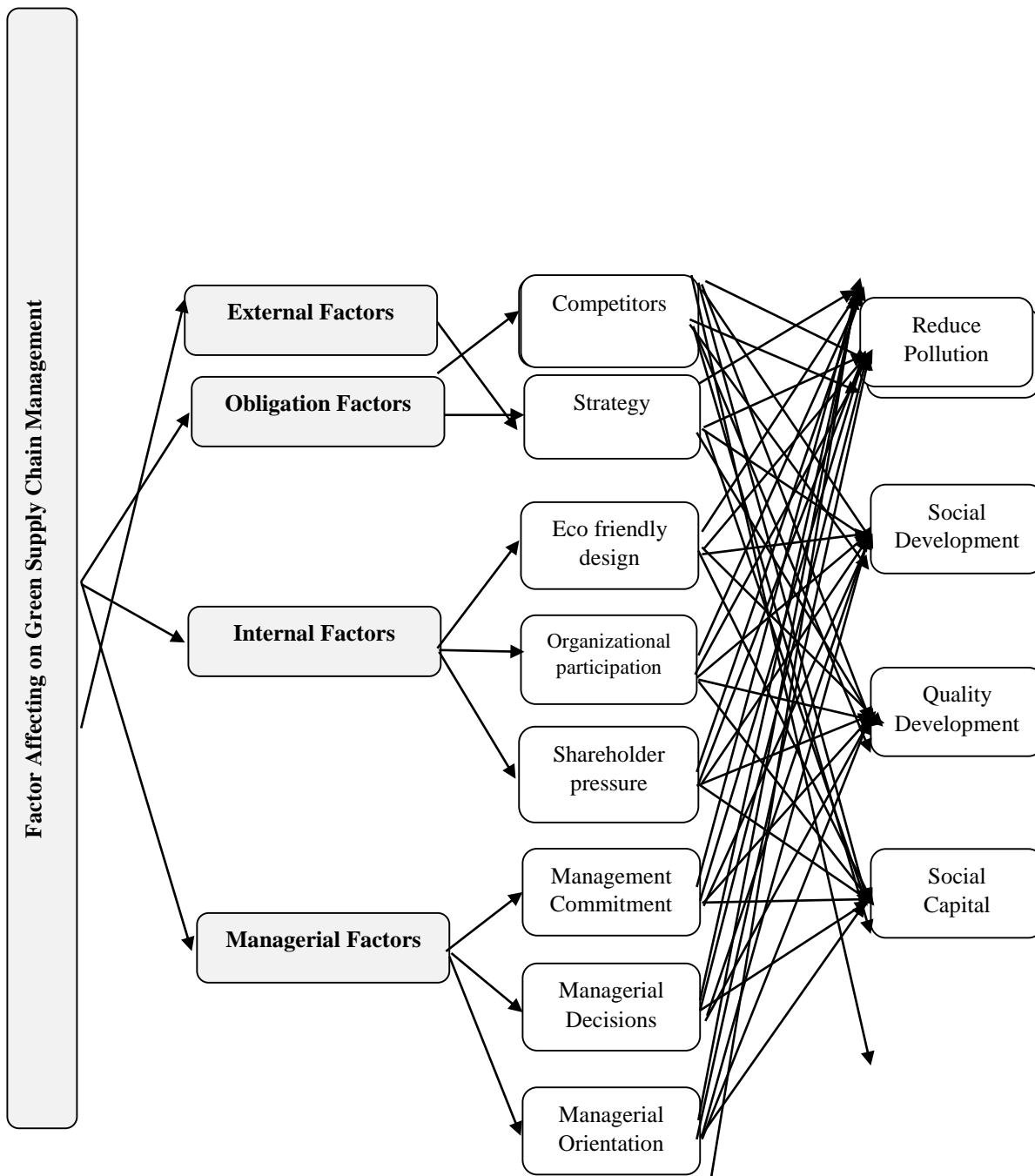


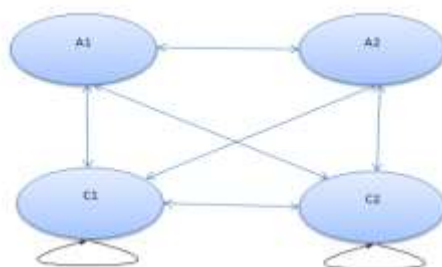
Figure 2: Conceptual Model

### 3 Conceptual Model

It is worth noting that green supply chain management have been identified by researchers that can be classified as follows based on common functions and concepts. The conceptual model of this study is presented as Fig. 2.

#### 3.1 Methodology

In order to prioritize the factors affecting the development of green supply chain, the network analysis process method was used. This method is one of the most popular multi-criteria decision making techniques. The network analysis process with ANP is one of the multi-criteria decision-making techniques developed by Mr. Saati to provide solutions to those multi-criteria decision-making problems that have relationships and interrelationships between decision-making levels. (Objective, decision criteria and its sub-criteria, alternatives) are presented. The process of network analysis is a hierarchical or AHP technique. This process is a set of personal judgments (decisions) and evaluations in a logical way. So it can be said that technique on the one hand depends on personal ideas and experience to form and plan a hierarchical issue and on the other hand it is related to logic, understanding and experience for decision-making and final judgments. But because the relationships in the AHP method are considered unilaterally and hierarchically, many multi-criteria decision-making problems cannot be solved due to internal and external dependencies and relationships and interactions between cluster elements. At the decision-making levels, it was considered hierarchically. In such decision-making issues, the ANP technique can be used with a comprehensive framework and considering all the interactions and relationships between decision-making levels, which form a network structure. In the ANP decision method, clusters represent decision levels and straight lines or arcs represent the interactions between decision levels. The direction of the arcs indicates the dependence, and the rings indicate the internal dependence of the elements of each cluster.



**Figure 3:** Dependence on the network analysis process

### 3.2 Data Analysis

The ANP methodology consists of three main steps, namely, (1) pairwise comparisons and local priority vectors, (2) weighted super matrix, and (3) super matrix formation. Journal of Engineering 3 destruction of companies. Because of the mentioned reasons, disruption risk is highlighted in this paper. The ANP can be applied to find the best strategy. In this paper, some alternatives are adopted in order to reduce or eliminate risk factors in a supply chain. These alternatives include total quality management (TQM), alignment, adapt-ability, agility, and lean. The AHP/ANP reduces a multidimensional problem into one-dimensional problem [14]. As the same as the AHP, in the ANP the main logic is based on pairwise comparison; however, this pairwise comparison matrix in the ANP is more complicated than that in the AHP. In the ANP, we should consider the relation between factors / sub factors and the connection between sub factors in one cluster to sub factors in another cluster in order to complete the super matrix. At first, the purpose is to find a strategy in order to decrease or eliminate the risk in the supply chain. Then pairwise comparison between network elements should be done, which is different from the AHP network comparison. To find the matrix priority and compute the consistency ratio (CR), we apply the Expert Choice software. The ANP is the extended form of the AHP that considers many item feedbacks, the impact of every element on the other criteria, and independency between and within the levels. Generally, the ANP excogitates network relationship, where  $C_k$  is the  $k$ th cluster ( $k = 1, 2, \dots, n$ ) and each cluster  $K_c$  consists of  $m_k$  items displayed by  $ek_1, ek_2, \dots, ek_{m_k}$ . Each column of  $W_{ij}$  is the priority vector acquired from identical pairwise comparison, indicating the significance of the elements in the  $i$ th cluster with respect to an element in the  $j$ th cluster [19].



$$W = \begin{matrix} & \begin{matrix} C_1 & C_2 & \dots & C_N \end{matrix} \\ \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_N \end{matrix} & \begin{bmatrix} e_{11}e_{12} \dots e_{1n_1} & e_{21}e_{22} \dots e_{2n_2} & \dots & e_{N1}e_{N2} \dots e_{Nn_N} \\ W_{11} & W_{12} & \dots & W_{1N} \\ W_{21} & W_{22} & \dots & W_{2N} \\ \vdots & \vdots & \dots & \vdots \\ W_{N1} & W_{N2} & \dots & W_{NN} \end{bmatrix} \end{matrix}$$

**Table 1:** Inner dependence matrix of the supply chain risk factors

	External Factors	Obligation Factors	Internal Factors	Managerial Factors
External Factors	1	0.758	0.415	0.63
Obligation Factors	0.571	1	0.5	0.218
Internal Factors	0.286	0.151	1	0.151
Managerial Factors	0.143	0.091	0.086	1

**Table 2:** Inner dependence matrix of the supply chain factors with respect to “Internal Factor”

	Eco friendly design	Organization participation	Shareholder pressure	Priority
Eco friendly design	1	6	7	0.758
Organization participation		1	2	0.151
Shareholder pressure			1	0.091

**Table 3:** Inner dependence matrix of the supply chain factors with respect to “Managerial Factor”

	Management Commitment	Managerial Decisions	Managerial Orientation	Priority
Management Commitment	1	1	4	0.415
Managerial Decisions		1	7	0.5
Managerial Orientation			1	0.086

**Table 4:** Inner dependence matrix of the supply chain factors with respect to “External Factor”

	Taxes	Competitors	Priority
Taxes	1	1	0.9
Competitors		1	0.1

**Table 5:** Priority of five alternatives based on supply quality.

	Reduce Pollution	Economic Development	Social Development	Quality Development	Social Capital	Priority
Reduce Pollution	1	3	5	5	0	0.485
Economic Development		1	4	6	7	0.271
Social Development			1	1	6	0.166
Quality Development				1	4	0.23
Social Capital					1	0.055

Computing the weighting of the super matrix via multiplying this matrix by priority of factors should be done as the final stage. Initial matrices represent the pairwise comparisons, which identify the priorities. These priorities corresponding to subfactors of pairwise comparison form the segments of the super matrix. The weighted super matrix will be changed to the limited super matrix by exponentiation. Produced numbers from the limited super matrix should be multiplied by priority of alternatives. The resulted numbers conduct us to find the best alternative with the highest score as the best strategy.

#### 4 Conclusion

Due to the fact that environmental pollution is increasing in the UAE, especially in Dubai, and according to the statistics provided, various industries, including manufacturing, construction, etc., have a higher percentage of pollution, all executive processes should be in Industries comply with environmental guidelines and standards. One of the main processes in industry is the supply chain system, and all components of this system have had a devastating effect on the environment. Therefore, in this study, the factors affecting the development of green supply chain in the construction industry in the UAE are identified and will be prioritized later. In this paper, the network analysis process method was used to prioritize the factors affecting the green supply chain in the UAE. The results showed that external factors, binding factors, internal factors and management factors affect the promotion of green supply chain system, respectively. And can have a positive impact on pollution reduction, economic development, social development, quality development and social capital.

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