# Utilizing GSCM for Waste Management in Green Building Operations & Analysis of Psychology Differences between Turkish and EU Rules

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## ABSTRACT

From site selection to design, construction, operation, maintenance, repair, and destruction, green buildings are resource- and environmentally-conscious. Sometimes referred to as green construction or sustainable construction. Current environmental concerns and the need for sustainability urge the use of existing energy, water, and material resources in a more effective and efficient manner. In addition, they ensure that trash is kept to a minimum, implement environmentally responsible and eco-friendly building design, and practise environmental sensitivity throughout the construction process. The management of construction waste through green supply chain management (GSCM) has gained prominence in recent years due to environmental concerns and the expansion of the construction sector. At each stage of the project, the design team, architects, engineers, and client must work closely together. By reducing energy consumption and waste, GSCM protects against any concerns that can impact the environment or people's health. This paper combines the green building operations of architects with the green supply chain management of engineers in order to reduce material consumption, promote more effective and efficient use of the energy, water, and materials currently in use, ensure the prevention of any type of waste, perform environmentally responsible and eco-friendly building design, and be able to reuse, recycle, or recover waste. In 2008, the European Union Council issued a waste management guideline to manage construction waste and reduce its environmental impact. The amount of recycled, repurposed, and recovered building and demolition waste (CDW) will be reduced by 70% by 2020. The objective of this research is to investigate cost-benefit and social-benefit reflections by combining these two approaches. The literature review and Turkish case study examples are utilised to establish a model from which recommendations for GSCM and reverse logistics operations for green building are derived.

Keywords: Waste management, GSCM, green buildings; psychology

#### **INTRODUCTION**

The proliferation of several businesses has contaminated the way people live nowadays. As a direct consequence of this, the well-being of future generations, as well as our own, is placed in jeopardy. At this time, there is a significant market demand for goods and services that are less harmful to the environment. Using the improved manufacturing processes, we are able to respond in a timely manner to the requirements that are outlined by our clients. Even within the sphere of building, every stage needs to be handled, from the very first concept to the very last demolition. One must take into consideration, in addition to the aesthetics and the functionality, the extent to which resources are utilised in an effective manner. When constructing a building that is environmentally friendly, the construction process makes use of a less amount of the available raw materials at the outset and a greater proportion of recyclable components. When a structure is still in the design phase, "greening" it is only permitted to be done by trained experts who have education and experience in architecture and civil engineering. The various suppliers as well as the subcontractors make up the various

Received: 15-September-2022 Revised: 18-November-2022 Accepted: 08-December-2022 components that make up the supply chain for the construction industry. In order to make a manufacturing line more environmentally friendly, green supply chain models will be required to connect each stage of the production line to all of the other participants in the supply chain. The creation of solutions that are kind to the environment is made possible by GSCM through the use of standards for waste management. Regulations governing the disposal of waste generated by construction projects are applicable in both the EU and Turkey. The primary goal is to increase production while simultaneously decreasing the amount of raw materials that are used in that production, and the secondary goal is to maximise material recovery. In addition to reducing the amount of materials required for construction, an early design for a green building can also reduce the amount of electricity and water consumed. If all of the prerequisites are met in a structure, then the building can be awarded the LEED (Leadership in Energy and Environmental Design) certification.

#### Green Supply Chain Resilience (GSCM)

The concept of supply chain management is constantly evolving [1]. Customers/suppliers, commerce, and logistics are all components of SCM [2]. From suppliers to customers, the supply chain advances [3]. The supply chain is a network of enterprises engaged in upstream and downstream processes and activities that generate value to the end customer [4]. The supply chain starts with the acquisition of raw materials and ends with the saleable completion of a product. Environmental challenges of today affect processes and generate new activities, such as rehabilitation. End-of-life materials supplied by customers can be recovered through closedloop supply networks [5]. End-of-life recovery seeks to divert materials, energy, and waste from landfills. Producers and consumers will gain greatly if this recovery is well-managed [6]. Regulations advise businesses of their environmental responsibilities. This results in ecologically friendly and long-lasting systems. Environmental concerns exist at every stage of the supply chain, from raw material purchase to recycling or disposal [7]. This necessitates the adoption of sustainable supply chains by businesses (GSCM). GSCM fosters competitive advantage, environmental awareness, and long-term viability [20]. According to an Indian study, GSCM implementation is under various degrees of pressure across industries [8]. On the other hand, it is clear that the fundamental characteristics of the construction industries are comparable across nations, giving practitioners and policymakers in other parts of the world who face similar issues related to building growth and the environment insight into "greening" the industry [21]. Environmental management systems, eco-friendly sourcing and design, investment recovery, and strong customer relationships can all be used in GSCM implementation [7]. Green activities and sustainability [2] share four themes: reduction, redesign, reuse, and remanufacture.

#### Waste Management

Environmental concerns are currently of the utmost importance, as development generates pollution of the air, water, and noise. Green materials are being used in construction design to reduce waste, and businesses are embracing green supply chain management to become more sustainable. Construction waste management, green buildings, and sustainable design are all used by manufacturers. The disposal procedure reduces construction waste. Recycling restrictions can be avoided by selecting recyclable materials [10, etymology]. At various phases, construction waste can be detected and quantified. The CDW type is determined early in the life cycle. The first section discusses concept, design, and material selection. CDW is calculated in the second half of the life cycle. The materials are revealed when the materials are destroyed during deterioration. Sustainable development is critical for leaving a healthy environment with favourable social, economic, and environmental conditions [11]. Strengthening the site-supply chain interface, updating the supply chain, shifting site operations to the supply chain, and integrating the site and supply chain are the four tasks of supply chain management in the construction business. A superior SCM facilitates the discovery of building difficulties and the provision of solutions [12].

#### Sustainability in Architecture

Aside from CWM, there are various more ways for minimising environmental pollution. Green building is now commonplace, just as it is in other industries. During the design phase, architects examine energy-efficient designs and materials. Green building solutions save 30% of energy, 35% of carbon, 30% to 50% of water, and

50% to 90% of waste [13]. Figure 1: The importance of creating green structures varies according to location ( Green Building Trends Smart Market Report published in 2013).

In the literature, green construction is characterised in a variety of ways. Green buildings are more environmentally friendly compared to traditional buildings. A second meaning is a construction that improves its surroundings. During green building, both energy and water are used and created. Throughout its lifetime, it makes efficient use of water, energy, and land [14].

## Simulate Supply Chains

The Directorate of Environmental Protection in Istanbul oversees building and demolition waste. Before specifying the construction or demolition trash, the contractor submits a 70 TL receipt and construction or demolition licence to the district municipality. This paperwork must be completed by the contractor, transporter (logistics company), and storage company. Trucks transporting CDW must be registered with Vehicle Tracking Systems (VTS) and get a transportation licence. Even if VTS is not explicitly referenced in the rule, it remains in effect. The Directorate of Environmental Protection of the Istanbul Metropolitan Municipality will only issue licences for vehicles bearing a VTS registration. VTS-registered forklifts must be yellow and may not have International J-Sup Chains on their sides. On both sides of the truck, The Mgt insignia, licence plate, and wording "excavation dirt and construction and demolition waste transporter" must be clearly visible. Although the legislation requires containers to be placed in front of the dumper trucks are used in practise. In Turkey, construction companies regularly hire subcontractors to store CDW. Municipalities must approve authorization to send waste to predefined sites based on landfill capacity. ISTAC is responsible for managing landfills and building recycling in Istanbul. ISTAC follows international and domestic rules [16]. Figure 1 depicts the supply chain of a Turkish construction company. In this technique, CDW is transported to a landfill.



Figure 1 depicts the current supply chain model of a Turkish construction company.

Table 1 displays the annual amounts of CDW that are discarded or recovered, as well as administrative sanctions.

	Unit	2010	2011	2012	2013	2014	Total
Disposed excavation soil amount	Thousand tons	24.100	47.709	52.455	65.502	69.999	259.765
Disposed CDW amount	Tons	5.361	5.680	5.152	0	0	20.451
Recovered excavation soil amount	Thousand tons	34	36	284	280	221	855
Recovered CDW amount	Tons	73.200	116.952	15.695	14.312	0	220.159
Administrative sanction	Piece	1.482	887	716	439	320	3.844
	Million TL	55	45	29	30	26	185

Given the above-mentioned stringent goals, managing construction and demolition waste in the EU is difficult. According to a study, symbols, the licence plate, and "excavation soil and construction and demolition waste carrier" must be written on both sides of the vehicle. This is required for waste management systems to function properly and to reach their full potential. Protection). According to the law, the containers in front of the construction site will be accompanied by dump trucks. Today, many Turkish construction companies use subcontractors to deliver CDW to storage facilities. Municipalities must request approval from the areas allotted based on the landfill's capacity. ISTAC is Istanbul's only company in charge of landfill management and recycling for the construction industry. ISTAC is part of the Istanbul Metropolitan Municipality, which follows national and international standards [16]. Figure 2 depicts the existing supply chain of a Turkish construction industry. The process has been completed in this exceptional business.

This demonstrates that the firm does not produce any waste, and the disposal of waste produced by the business in a landfill could be harmful to the environment.

#### Discussion

GSCM's implementation of green building principles GSCM must be used to reduce the amount of raw materials used in the structure's body in order to meet waste management goals. It is difficult to achieve a balance between the quantity and strength of the material at the intended pH for the various material kinds. It is possible to utilise less "green" material while maintaining the same level of structural strength as when using conventional material. They are replaceable with more contemporary materials. They are durable and lightweight, recyclable, and GSCM-compliant. The design of sustainable systems permits the reuse of waste resources in construction projects of inferior grade. In addition to end-of-life collection, rubbish production must be reduced in both Turkey and the EU in order to meet the legal requirements. Green construction already has the benefits of reducing the amount of materials required and lowering expenses.

Integration of a new system into an existing project may be challenging. Therefore, architects should begin the design process by considering green building concepts. Green building design and GSCM will have a positive social and economic impact while adhering to regulatory regulations.

#### Conclusions

The goal of this paper is to analyse the costs and social benefits of GSCM and green building design utilising Turkish case studies and literature reviews. A methodology and ideas for GSCM- and reverse logistics-based Green Building operations are developed. Utilizing a green supply chain management flowchart, the CDW management system in Turkey is comprehended in detail. The outcomes of this analysis suggest that there are quantitative disparities between Turkish and EU rules. Due to the fact that Turkey's rule on the management of excavation soil, construction, and demolition waste does not specify target volumes, construction companies are uncertain of the consequences of dumping garbage in a landfill. Throughout the planning phase of a construction project, green and less expensive materials may be selected in order to make the supply chain more sustainable. Components of "green building design" are incorporated into the construction process from the outset with this idea. Following waste minimization, CDW recovery processes are the next stage. If the construction company manages waste and has a closed supply chain, it will be able to reuse secondary raw materials and remanufactured goods on its own site. These secondary materials could be offered on the market as well. Customer points may be developed afterwards to sell rescued goods and any remaining goods that the firm will not use on their website. Developing a capacitated linear mathematical model with the potential for numerous products, multiple recoveries, and multiple production allows a construction company to employ its own recovered materials on its own construction sites as part of future research. Finally, if the aforementioned modifications are done, such as incorporating green building design into GSCM and constructing a supply chain for the construction industry, the system will be sustainable, and the construction business will be able to lower costs while earning from its own waste.

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