Research on the construction of green transport network for construction waste

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Abstract. With the rapid development of my country's construction industry, soil, groundwater damage and environmental pollution caused by construction waste are becoming more and more serious. Therefore, research on the location, classification and treatment of construction waste is very important to conserve resources and protect the environment. Starting from the construction of a construction waste green operation network, this paper first briefly analyzes the operation characteristics of construction waste logistics, including the positioning, classification, treatment mode and treatment process of construction waste, by consulting a large number of literature materials. Then, from the perspective of supply chain and green sustainable development, a green transport network of construction waste is set up to provide a foundation for the disposal of construction waste and the protection of environmental resources.

Keywords: construction waste, green transportation, logistics network.

1. Introduction

With the rapid development of the national economy, China’s annual building area is gradually increasing. According to incomplete statistics, my country’s annual new building area is about 2 billion square meters, accounting for half of the world, and ranking first in the world. In the process, a large amount of solid waste-construction waste is produced. In recent years, the amount of construction waste in my country has accounted for 30%-40% of the total urban waste. However, the vast majority of construction waste does not have any treatment, and it can be rushed through simple open-air stacking or landfilling. This will not only harm the soil and groundwater pollution, but also cause significant economic losses. At the same time, in the face of increasingly severe environmental problems and increasingly tight land supply, the generation of construction waste has undoubtedly aggravated the contradictions between people and the environment, and affected the coordinated development of the urban ecological environment. At present, my country's national policies are also leaning towards ecological sustainable development, and environmental protection has become an eternal topic of the current era. The green treatment of construction waste is imminent, and green logistics provides good theoretical and methodological support for this purpose.

In view of this, this article combines the core idea of green logistics with the recycling of construction waste, and focuses directly on the key point. The low level of utilization of construction waste is placed in the green logistics operation network for analysis, from the three aspects of logistics, capital flow,
and information flow. From the perspective of the supply chain, we will conduct detailed research and analysis on the construction of the construction waste green operation network, and analyze the construction waste treatment problems one by one from the perspective of the supply chain, which provides a favorable support for improving the level of urban construction waste treatment.

2. Operating characteristics of construction waste logistics

2.1. Clear positioning and classification of construction waste
According to the Regulations on the Management of Urban Construction Garbage and Engineering Residue (Revised), construction waste refers to the waste of building sludge, mud and other wastes generated by the construction, demolition, repair and decoration of construction units or individuals.

(1) Divided by source: construction waste can be divided into four categories: road excavation, land excavation, construction waste and old building demolition waste.

(2) Divided by construction waste generation method: Construction waste can be divided into construction waste (approximately 80%) and construction demolition waste.

① Construction waste: mortar, concrete, sand, concrete bricks, reinforced concrete pile heads, scrap metal materials, bamboo wood materials, packaging materials, etc.

② Building demolition waste: bricks, rubble, wood, broken glass, lime, muck, discarded frames, concrete blocks, metal, bricks, blocks, plastic products, etc.

2.2. Construction waste disposal process
Construction waste treatment is a complex process that is a collection of garbage collection, garbage classification, garbage transportation and processing, renewable resources trading, inspection and supervision and other aspects of the coordinated development of the process. Not only should we promote the separate collection of construction waste, we should also actively encourage recycling and reuse, and consider sustainable development. The construction waste treatment industry involves recycling companies, transportation companies, demolition companies, construction companies, governments, research institutions and other related units that cooperate with each other to form a construction waste treatment industry chain. Through a comprehensive analysis of each link of construction waste, according to the interaction of each entity in the industrial operation, the operation mode and interaction mode of the construction waste industry chain are proposed.

3. Construction of green transport network for construction waste

3.1. The main role and positioning of key subjects
The operation of the construction waste logistics network not only directly involves construction companies and construction waste recycling and processing industries, but also involves the government and related and supporting industries such as resource assessment, product quality certification, technical consultation, and recycling equipment manufacturing. The cross operation between these enterprises or industries has greatly promoted the circulation operation of the entire construction waste logistics network.

(1) Government: The government is at the core of the entire construction waste logistics network. The government not only provides direct policy support, but also indirectly affects the entire network through other means. On the one hand, the government imposes restrictive measures on the non-industrialization of construction enterprises, forcing the waste of construction enterprises to be disposed of and paid for by recycling enterprises. On the other hand, in order to promote the research and development of construction waste technology and recycling equipment for related and supporting industries, the government has implemented corresponding economic incentive policies, so that these research results can more fully and effectively affect construction waste recycling and treatment enterprises, and directly serve the construction waste recycling and treatment enterprises. Construction enterprises, building materials market, related and supporting industries and construction waste
recycling enterprises interact with each other under the support of government intervention, which ensures the smooth operation of the whole logistics network of construction waste disposal.

(2) Logistics companies: Construction recycling logistics companies are generally some logistics companies, fleets, or a logistics department of a large construction waste recycling and processing company. It is responsible for various logistics activities of the entire network, including packaging, sorting, storage, transportation, loading and unloading, circulation processing, distribution, and testing. The main role of construction waste in the construction waste green logistics operation network is a comprehensive operation center that transports construction waste, renewable resources and products flowing in the network from the entrusted place to the demand place in accordance with the requirements of other subjects.

(3) Recycling and processing enterprises: The main task of construction waste recycling and processing enterprises is to entrust logistics companies or fleets to transport construction waste from construction sites to the enterprise, or to receive construction waste from construction sites. According to the classification of work tasks, construction waste recycling companies can be divided into construction waste (waste materials) recycling companies and waste disposal companies. The former mainly crushes, cleans, classifies, extracts, and sells construction waste; the latter mainly deals with the solid waste that has finally undergone scientific treatment, such as landfilling and incineration.

(4) Building materials market: Their main task is to supply building materials. The main role in the construction waste green logistics operation network is the main body of building materials supply. At the same time, in this network, they are also users of renewable resources or products made from construction waste.

3.2. The frame structure of construction waste logistics network

In the construction of the construction waste green logistics network, the building materials market, construction enterprises, government, construction and waste recycling and processing enterprises (recycling logistics enterprises), these four types of participants are interconnected and mutually supportive, and they involve complexities. Logistics, capital flow and information flow process, as shown in Figure 1.

![Figure 1. Overall framework of logistics network](image-url)
(1) Logistics: Starting from the government, first of all, construction waste is processed on the construction site or after simple treatment. Part of the renewable resources that can be directly used can be transported directly to the building materials market for sale by the logistics company, and the rest will be sold by the logistics company. The logistics enterprises are transported to the recycling and processing enterprises, and the logistics costs incurred are paid by different entities according to the nature of the construction waste or the relevant contracts and treaties signed between the entities. Secondly, the recycling and processing enterprises will process these construction wastes in multiple processes to generate renewable resources. Some of them will be shipped to the building materials market for sale by logistics enterprises or fleet, and some of them will be used for backfilling mines or as roadbeds. Most of the logistics costs generated by this part will be responsible by these recycling and processing enterprises. Finally, the building materials market will sell these renewable resources or products to construction enterprises, thus forming a circular logistics network, each link is interlinked, but also to maximize the low-cost and efficient operation of logistics.

(2) Capital flow: starting from the same government, first of all, construction waste is transported from the construction company to the recycling company. The construction company or the government needs to pay the recycling company a certain construction waste disposal fee, and the logistics cost to the logistics company is based on both parties. The contract or clause stipulates which party will issue it; secondly, the recycling company will process these wastes to generate renewable resources and transport them to the building materials market or mines and road construction sites. While obtaining the sales revenue of renewable resources, they will also provide logistics companies with relevant logistics. Expenses; Finally, the building materials market pays the purchase of renewable resources to processing companies, and then sells these resources and products to construction companies or the government, pays for logistics costs, and obtains sales of building materials, thus forming a circular flow of funds.

(3) Information flow: If these four key entities involved in the resource processing of building materials are built into a circular logistics network, then the exchange and docking of information will exist in the corners of this network. Regarding the establishment of information flow, it is planned to set up a comprehensive logistics system information platform in the construction waste logistics system. By integrating relevant information inside and outside the system, information can be effectively circulated and shared among various main elements, which is helpful Make reasonable decisions for the main body of the system, so as to realize the circulation of resources.

4. Conclusion
Based on the analysis methods of consulting a large number of literature materials and conducting field investigations, starting from the construction of a construction waste green operation network, firstly, a brief analysis of the operating characteristics of construction waste logistics, including the positioning of construction waste, treatment modes, and treatment processes, is carried out; From the perspective of supply chain and green sustainable development, a construction waste green logistics network has been built, which connects every subject that construction waste passes through, interlocking each other, and analyzes the logistics, capital flow, and information flow of the operating network. Three aspects provide favorable support for improving the level of urban construction waste recycling treatment. However, due to the limited ability of the author, there are still many improvements in the research content and methods. The construction of green logistics network of construction waste is still only in the theoretical stage, and the proper mathematical model has not been used to carry out more complex and accurate analytical analysis. In the future, the rigorous mathematical modeling will be further studied.

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