

# Emergency Logistics System Based on Sudden Epidemic Situation

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## Abstract

The efficient operation of the emergency logistics system can effectively minimize the damage caused by sudden disasters to all parties. Based on the sudden epidemic situation, the problems existing in the emergency logistics link are proposed, and related suggestions for the improvement of the emergency logistics system are proposed.

## Keywords

Outbreak, emergency logistics, emergency logistics system, development proposals.

## 1. INTRODUCTION

In early 2020, a new type of pneumonia broke out in China. On January 14, 2020, the world health organization officially named the novel coronavirus 2019 (2019-ncov). The epidemic has affected a wide range of people and seriously affected the daily life of people around the world, posing great challenges to the work of the transport sector. Due to the Chinese New Year festival, the logistics in all parts of the country is in a state of semi-stagnation, there are many inconveniences in the transportation and transfer of goods and materials, and the economic and life loss caused is incalculable. Therefore, the establishment of an effective emergency logistics system can quickly link all individuals and units on the emergency supply chain and realize the sharing of information on all nodes in the whole chain. [1] This is also a prerequisite to ensure the timely and stable supply of medical supplies

## 2. CURRENT SITUATION OF EMERGENCY OF EMERGENCY LOGISTICS SYSTEM AT HOME AND ABROAD

### 2.1. Research Status of Emergency Logistics at Home and Abroad

Overseas researches on emergency logistics started earlier, and more researches were conducted by mathematical analysis and modeling, which laid a theoretical foundation for researches on logistics, transportation, storage, distribution and other aspects. Stephenson and Kenball [2] First proposed to apply the logistics management method to the relief material transportation process. Suleyman Tufekci proposed a modular and integrated decision support system for the problems exposed by hurricane Andrew in the United States, which was the early prototype of emergency logistics system. Stephen et al. designed a variant of the cost-sharing contract for the supply chain in the event of a flu outbreak, and showed that it provided an incentive for vaccine buyers and sellers to improve vaccine supply. Ming et al. [3] Artificially controlled the spread of the epidemic and established a dynamic logistics model for medical resource allocation to minimize the total cost.

In China, emergency logistics mainly focuses on the storage of disaster relief materials and fund management. Gao dongna et al. classified emergency logistics as a special category of logistics activities and pointed out its characteristics such as suddenness and uncertainty. Ou zhongwen et al. put forward the concept of "emergency logistics" for the first time, and

discussed its background and research content. Du et al. took the maximization of transportation time as the primary goal, established a model based on the characteristics of emergency logistics, and solved the model by using dichotomy. Qin xinghong et al. put forward Suggestions for the existing problems in China's emergency logistics under the outbreak of influenza a. Aiming at the problem of vaccine shortage in the case of sudden epidemic, Chen yong et al. established an integer programming model, which provided a basis for the optimal plan of resource scheduling in the emergency logistics distribution system. In order to solve the problem of site selection of emergency material warehouse, feng jianrui et al. proposed a mathematical model of site selection of emergency material warehouse considering more practical factors, and designed a variable weight algorithm to solve the model. emergency material warehouse, feng jianrui et al. proposed a mathematical model of site selection of emergency material warehouse considering more practical factors, and designed a variable weight algorithm to solve the model.

## **2.2. Development Status of Emergency Logistics at Home and Abroad**

The development of foreign emergency logistics system is in step with the development of enterprise logistics. A number of advanced logistics concepts, such as separation of commercial flow and logistics, third-party logistics and supply chain management, can be seen in overseas emergency logistics systems. [4] The United States has a comprehensive national earthquake disaster response plan. In the event of a major disaster, the government immediately declares a federal emergency response plan, with the federal emergency management agency (fema) coordinating all disaster prevention and relief efforts. [5] Professional institutions such as the German technical assistance network provide professional knowledge and advanced technical equipment for the logistics supply and transportation of disaster relief materials, which play an important role in the domestic emergency logistics response.

Compared with foreign countries, China's disaster relief management system started relatively late, and mainly implements the unified decision-making of the government, the coordination and coordination of various provincial and municipal governments, and the unified organization and command of local governments. In particular, the army plays a crucial role in the rescue of major disasters. [6] Although China's disaster relief and emergency logistics systems have made significant progress compared with the past, there are still many deficiencies in the response to sudden outbreaks, and the epidemic relief work is slow.

## **3. ANALYSIS OF THE EMERGENCY LOGISTICS SYSTEM UNDER THE CURRENT EPIDEMIC SITUATION**

### **3.1. Unreasonable Reserve of Emergency Supplies and Problems Existing in Pre-Planning of Supplies**

Due to the outbreak of the epidemic, medical supplies were in short supply, and many hospitals were once in short supply, so they had to seek help from the public through social channels. Medical supplies are characterized by fast consumption and one-time use. Due to the lack of effective material planning, it is difficult for government departments, hospitals and other relevant medical departments to treat patients and ensure the safety of medical personnel in the face of the rapid increase in the number of epidemic patients. Therefore, effective reserve of emergency supplies and advance planning play a crucial role in the effective response to the epidemic [7].

### 3.2. The Information of Emergency Supplies Shortage Is Not Transparent, and the Information of Supply and Demand Is Asymmetric

After the outbreak of the epidemic, hubei province, which is at the eye of the storm, has seen a sharp rise in the number of cases. Many hospitals are overcrowded and medical resources are running short. However, the specific type and number of shortages of medical equipment, protective clothing and other materials from all walks of life are still unknown. Most of the resource shortage information comes from social channels, and it is difficult to distinguish the true and false information. The asymmetry of supply and demand information further leads to the waste of manpower and material resources. Therefore, material information transparency and supply and demand information symmetry play an important role in the rapid response to the epidemic.

### 3.3. Imperfect Emergency Logistics Organization System

Because China's emergency logistics is still in the development stage, the operation system and process are not perfect, and it is also the Spring Festival, the transportation capacity of all parties is in a semi stagnant state, the personnel are generally on vacation, the relevant departments are lack of emergency logistics awareness, and the logistics party has not formulated relevant emergency measures for the material storage, transportation, distribution, material detoxification and other matters, resulting in the shortage and transportation of materials in the epidemic Slow infusion affects the effective development of treatment. Therefore, it is very important for relevant departments to establish emergency logistics system, start-up system and improvement system in advance.

## 4. EMERGENCY LOGISTICS SYSTEM BASED ON THE OUTBREAK

### 4.1. Emergency Logistics System

Emergency logistics, refers to the pursuit of maximum benefits of time, the disaster losses and adverse effects of minimized goal, through integration of modern information and management technology procurement, transportation, storage, distribution, distribution, information processing, and other various functional activities, for all kinds of emergency supplies needed for the sudden public events from the origin to destination efficient planning, organization, implementation and control process. [8] The purpose of the emergency logistics system is to deliver emergency supplies to the disaster site in the shortest possible time and at the lowest possible cost through efficient transportation and timely distribution to those in need.

### 4.2. Construction of Emergency Logistics System

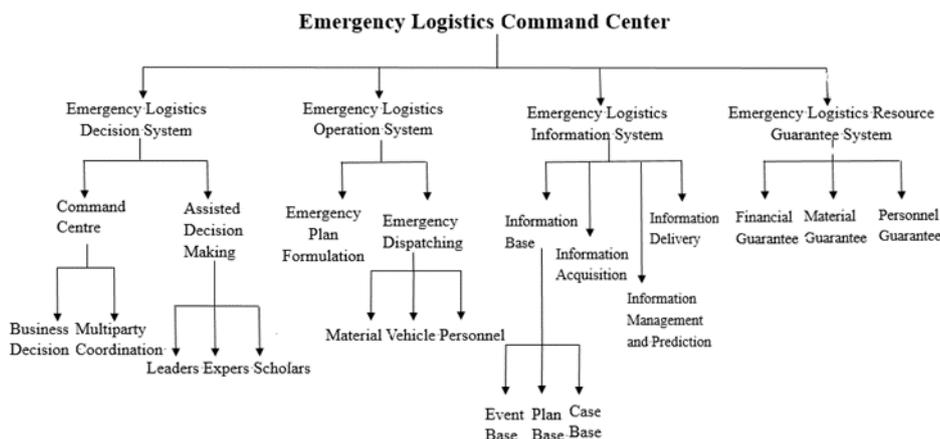


Fig 1. Structure diagram of emergency logistics system

In order to effectively respond to emergencies and in combination with the characteristics of emergency logistics, an emergency logistics system is constructed in this section, as shown in figure 1. An emergency logistics command center is set up to coordinate the work of all parties and ensure the orderly implementation of emergency work. Under it, emergency logistics decision-making system, emergency logistics operation system, emergency logistics information system and emergency logistics resource guarantee system are respectively set up. The coordinated operation among these systems ensures the efficient operation of emergency logistics.

### **4.3. Suggestions on the Development of Emergency Logistics System Based on Epidemic Situation**

4.3.1 Relevant systems shall open Windows to ensure information openness and transparency

At present, China's response to emergencies, the use of the government from various departments to form a temporary incident handling office, staff lack of professional knowledge and other shortcomings; Some studies have shown that special emergency response mechanisms should be set up for different disasters, but their large investment and high maintenance and operation costs. Therefore, in order to ensure a timely and effective response to the disaster, a permanent emergency response department can be established, whose responsibilities are held concurrently by the relevant personnel of all government departments, and a small number of full-time personnel can be hired to take charge of the storage and management of emergency supplies. To guarantee the accuracy of the relief supplies information, available separate emergency window opening related government system, daily issue of relief supplies, storage, information management, the sudden disaster, besides the current inventory information release, still can release requirements for material quantity, type, such as specific information, convenient materials production enterprises, the social from all walks of life can fast and accurate for aid.

4.3.2 Adopt segmented logistics transportation to ensure logistics efficiency and personnel safety

In order to do a good job in epidemic prevention and control of emergency material transportation, we can adopt segmented logistics transportation for road transportation. According to the traffic condition of the highway, the segmented logistics can be divided into two categories: if the expressway is unimpeded, a logistics transfer node or hub can be set up at the exit of the expressway station entering the epidemic area province. The non-epidemic area transport vehicles can unload the materials to the node, and the vehicles in the epidemic area can transport the goods from the node to the city. If the expressway is restricted, logistics transfer nodes or hubs can be reasonably set up at the border of the epidemic area province and the adjacent province of the non-epidemic area to ensure the supply of goods and materials.

4.3.3 Formulate logistics emergency plan in advance to ensure the smooth transportation system

When storing emergency supplies, the relevant departments shall purchase the needed materials in time. [9] First of all, the emergency handling department established should review the production status of multi-type material production enterprises in advance, and sign purchase contracts with enterprises with high reputation and strong reliability, so as to put the material plan in front, so as to ensure the supply of relevant material consumption in the disaster. Secondly, relevant departments should formulate effective emergency logistics operation system with transport capacity enterprises in advance, so that each transport capacity enterprise can timely transfer transport capacity and open exclusive channels for rapid

transport of relief materials and personnel, so as to ensure the effective implementation of the rescue.

In addition to the general relief supplies, the relief drugs and vaccines needed for medical relief need to be stored in a more strict environment. The relevant departments should set up special temporary emergency supplies storage warehouses according to the specific situation of the supplies. [10] In addition, a variety of flexible delivery methods can be adopted according to different disasters. For example, in order to avoid picking up and mailing items face to face, disinfection express cabinets can be promoted to ensure safety.

4.3.4 Attach importance to the collaborative work of supply chain and establish the assistance system of neighboring provinces

All provinces and cities should fully attach importance to the production capacity of emergency supplies, the ability of local production areas to eliminate emergencies, and the coordinated work of supply chain. The supply chain security system still needs to be put into construction. In order to quickly respond to the sudden disaster, an assistance system can be established among neighboring provinces to help them overcome the difficulties with multiple resources. In the procurement of emergency supplies, if a province with a sudden disaster runs out of emergency supplies, neighboring provinces can coordinate and share emergency supplies to alleviate the shortage of supplies. In the process of logistics transportation of emergency supplies, neighboring provinces may also be used to coordinate the opening of transport corridors to ensure the timely arrival of supplies to areas awaiting assistance.

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