Emergency Materials Distribution Risk Control

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Abstract-In recent years, all kinds of frequent occurrence of unexpected events, damage is very serious, affect the range is very wide. These sudden public events not only cause great loss of life and property, but also affects the social stability, and even endanger the national security, the economic society to develop overall situation produces major effect. Emergency materials distribution level is directly related to whether the effective control of various emergencies, as far as possible so that the losses are minimized, avoid disaster expand. Therefore to strengthen the emergency logistics operation in the process of risk management is the urgent need of developing situation changes, the successful operation of emergency logistics is one of the key. And the implementation of accurate, comprehensive, rapid risk analysis and implementation of emergency logistics risk management.This article through to the emergency materials distribution of risk analysis, understanding of emergency materials distribution risk comes from where, and its risk control. The control method has established non affected areas of emergency material sending and receiving points between the affected areas of emergency materials distribution network, distribution scheme decision and preliminary analysis on emergency materials distribution center, warehouse storage to do regular checks. In the disaster areas of much-needed material to the shortest possible time delivery to the disaster area, improve the distribution efficiency, reduce the losses caused by disasters, but also ensure the material distribution in an orderly manner, avoid the invalid distribution.

KeyWords-Emergency logistics; Material distribution; Risk control; Wenchuan earthquake

I. INTRODUCTION

Various natural disasters caused by world political and economic strategic pattern change and adjustment, global warming, religious conflicts are endless, making many countries and regions attaches great importance to of emergency management, seeking to reduce the loss of life and property through effective emergency management, maintaining social stability and development. Thereof, emergency logistics is an important item. In other countries, the protection of emergency logistics is generally merged into emergency management for study and construction.

With the accelerated development of economic globalization, countries' industrialization and urbanization continually deepening, major natural disasters, major accidents and disasters, major public health incidents and social safety incidents have often occurred; new situations and new problems emerge all the time. On the one hand, these sudden public events are likely to cause huge casualties and property losses, necessarily needing a lot of emergency material to reduce casualties and property loss caused by all kinds of public emergency, to prevent further deterioration of the hazard, to accelerate reconstruction and restore order and speed up production. On the other hand, although the development of technology improves the forecasting ability of disasters, but most of the natural disasters, major accidents, public health incidents and social safety incidents are difficult to predict or there are very short intervals between forecast and occurrence, which put forward higher requirements for emergency material distribution risk control for providing material support. Therefore, the study of emergency material distribution risk control has a very important practical significance.

II. THEORY SUMMARY

A. Related theories of emergency logistics, material distribution and risk control

1) Emergency logistics

Emergency logistics refers to the logistics operation taken in response to unexpected events (including fire help, hazardous substances events, flood rescue, tsunami and earthquake relief, epidemic control, etc.), with time-limited, heavy task, difficult to coordinate, high risk and other characteristics. From the logistics operation situation in response to various emergencies in recent years, effective implementation of risks management in logistics operation process has become one of the key factors to succeed in the operation of emergency logistics. The implementation of accurate, comprehensive and rapid risk analysis is the key of emergency logistics risk management.

2) Material distribution

Material distribution is a kind of purchase and sale mode that the logistic firms deliver the booking goods of certain kinds, number, and time to the users (production line) according to their requirements with a series of classification, allocation and arrangement.

3) Risk control

Risk control means the risk managers take a variety of measures and methods to eliminate or reduce the risk

possibilities of various events, or to reduce the loss when the risk incident happened.

B. Current situation of domestic and overseas emergency material distribution

1) Current situation of domestic emergency material distribution

We are a country prone to natural disasters that natural disasters occur almost every year. Therefore, with strengthening the establishment of emergency disaster response mechanism and emergency material support, the studies of emergency relief material transportation problem is particularly urgent.

Emergency relief material transportation is a central issue in the field of emergency management. The research is the logistics process about how to mobilize sufficient vehicles in the shortest possible time and deliver emergency material from each material reserve point to the hit points safely and fast.

The emergency material are to the masses usually issued by government staff, relief forces, low efficiency, narrow distribution, so the result is not satisfactory. Emergency logistics and distribution system is far from perfect, less flexible distribution methods, resulting in serious problems in transportation. When carrying out emergency relief, there is no powerful resultant force taking emergency rescue mission as the core, which results in very poor timeliness of emergency treatment, and does not reflect the characteristics of the emergency vehicle.

2) Current situation of overseas emergency material distribution

The research on emergency logistics received attention only in recent years, so there are fewer domestic and international research literatures. Foreign related research started earlier than domestic research, Kem ball Cook and Stephenson proposed the theory that logistics management is important in transporting relief material firstly. Ray, Rathi and Wael then studied the emergency material distribution problems taking minimum transportation costs as the goal under different constraints; Linet put forward a relief material distribution model that taking minimum losses caused by dissatisfying disaster point needs as the goal, and gave examples of validation.

After years of exploration and development, United States, Japan, Europe and other major countries in the world formed emergency management system well. The established relatively perfect emergency rescue system is gradually developed to standardized direction, so as to the entire emergency management work including the distribution of emergency material becomes more scientific, standardized and efficient.

III. EMERGENCY MATERIAL DISTRIBUTION RISK FACTORS

A. Risks of emergency logistics

There are many risk factors that affect the operation of emergency logistics, affecting relations complicated, and severity of the consequences caused by various risk factors are different. Risk identification refers to the process to investigate and research all aspects of emergency logistics operation and each critical technical process to identify and record all the risks and make a qualitative estimate for the consequences. It is an important thing before conducting a risk analysis. It is mainly used to answer what risks should be considered, what's the main factors causing these risks and how serious the consequences arising from these risks. Risk identification should be started from systematic view, breaking down many complex factors causing the risk into relatively simple and basic units that are easily recognized, and then find out the essential relationship between the risk factors from the intricate relationships, analyzing the severity of emergency logistics change caused by them. The paper identifies the risk factors in five phases of emergency logistics operation mainly from four aspects including technology, management, environment and operation, as shown in Figure 2.1.

Time risk, maturity of emergency logistics technology, risk of information integration and sharing, risk of information transfer, resource risk, climate risk, rationality of transport layout, construction and reason of logistic center, full considering of planning, effectiveness of organization, communication risk, decision risk, improper management control mechanism, expenses risk, human resource risk, accuracy of operation, serviceable rate of operating equipments, linking degree between operating activities.

In emergency disposal of sudden disasters, the supply of emergency material is one of the most important works. Fast and effective scheduling and distribution of materials is not only the premise and condition of performing effective emergency rescue, but also the necessary support to reduce the loss of life and property, prevent secondary disasters, and safeguard social stability for sustainable development.

From the above table, we can see that there are risks existing in various aspects of emergency logistics. The paper focuses on one of them, that is, the risk of emergency material distribution.

B. Emergency material distribution risk

In emergency disposal of sudden disasters, the supply of emergency material is one of the most important works. Fast and effective scheduling and distribution of materials is not only the premise and condition of performing effective emergency rescue, but also the necessary support to reduce the loss of life and property, prevent secondary disasters, and safeguard social stability for sustainable development.

Certainly, emergency material distribution has various risks, as the following Fig.: Emergency material distribution risks: 1. Large warehouse material reserves conditions; 2. Distribution vehicles conditions and maximum load. 3. Demand information is not clear. 4. Influencing the transportation routes. 5. Emergency degree of demanding. 6. Information networks is damaged.

From the actual demand, material distribution under emergency conditions has the following major risks:

(1)If it's material reserves of emergency material distribution center, whether the reserves are sufficient;

(2)Whether it is the conditions of distribution vehicles number and the maximum load of each vehicle;

(3)The demand information is not clear and determined, material demand cannot be calculated and measured accurately. In most conditions, estimate as per roughly conditions, data error and change range is bigger;

(4)Disaster process affects transportation routes, resulting in dynamic changes of transportation road network, and vehicle driving speed is also affected by the weather, disaster and transportation flow, so the specific running time of the vehicles cannot be sure;

(5) Emergency degree of different material demanding point is different that bring difficulties for the priority and scheduling.

(6)Information network is damaged that cannot send disaster relief message timely.

IV. EMERGENCY MATERIAL DISTRIBUTION RISK CONTROL ANALYSIS

A. *Preliminary work of emergency material distribution risks control*

Emergency material distribution risks control shall include the following preliminary work according to the disaster severity:

(1) If the disaster area is too large, classify the disaster area according to their severity, ensuring the material arriving to the place which needs them the most.

(2)If various emergency material volumes are too large, select the most urgent materials and ensure them arriving disaster area firstly.

(3)If too much emergency materials are needed, divide the non-affected area into different regions to ensure timely supply of emergency material.

(4)After the disaster happened, divide the disaster area into x regions, each shall select an emergency material receiving points. Then according to emergency material demanding amount, divide the non-affected area according to the distance from disaster area and set one or more supply regions, and each supply region will be divided into x small region, in which will be set up an emergency material center and build distribution network among each center within supply region and emergency material receiving points in the disaster area according to assignment problem model. The network of each distribution region should be run at the same time to deliver emergency material to disaster area which can distribute emergency material to different area and make them arrive at different time. Then depend on whether the disaster affects the inner transport in disaster area, if not, one-to-one distribution between the material center and receiving point as per assignment problem model.

B. *Emergency material distribution risk control methods*

1) Examine the reserves conditions of larger warehouse regularly

Real-time reserves conditions of emergency logistics distribution center should be noted. The reserves of large warehouse should be ensured to be sufficient, if not, supply the insufficient part in case of disaster. Perform routine check for the reserves material, and the bad and overdue material should be replaced or processed in other ways.

2) The issues of distribution vehicles and their maximum load

Regarding the vehicles and maximum load issues, the material should be distributed according to the quantity demanded and emergency degree. When sudden disasters happening, the distribution vehicles are usually insufficient, so we can expropriate vehicles from the society to ensure delivering relief material to the disaster area in the shortest time.

3) Regarding the disaster area without clear demand information, we should classify the disaster area and material

After the disaster, the township, county, prefecture and provincial government and relevant departments should activate the contingency plans of relevant levels and departments according to the disaster severity, hierarchical management and principles of performing their duties, do good job of victims evacuation and living arrangements, disaster relief, disaster monitoring, disaster investigation, assessment and reporting, to minimize the loss of life and property of the people. According to hazard rating of unexpected natural disasters and other factors, assess the affected area, if the affected area is small, deal with the affected area as a whole; if the affected area wide, then the affected area is divided into several levels.

4) If the transportation routes are damaged, we need to classify the non-affected area and schedule the reserves to the disaster area

After the disaster, depending on the demanding status of emergency material and emergency material inventory status of non-affected area, if the nearby areas are possible to meet the needs of emergency material, which should be provided by the them entirely; if the emergency material demand is larger, then divide the non-affected areas in accordance with the order from near to far into one or even multiple supply regions according to the actual situation. The selected supply regions are independent, while distributing material to the affected area at the same time, which can ensure continuous supplies in stages to reach the affected areas and an adequate supply of emergency material while reducing waste due to excessive supply.

5) Emergency degree of the demands

Regarding this problem, we can estimate on the spot according to the disaster severity, area, road conditions. Although the estimated results are not very accurate, it is an effective method.

6) Information network damage

If the information network was damaged, we need to get the detailed information of disaster area through other ways and channels, for example, our soldiers walked to the disaster area to get the damage information in Wenchuan earthquake.

To decrease the risks in the process of relief due to lack of materials, the emergency material distribution risk control on emergency based on relief material characteristics seems very important. Following diagram indicates the emergency material distribution risk control methods:

emergency material distribution risk control methods

distribute according to demand quantity and emergency degree disaster area classification to get information

a) reserves conditions of large warehouse

b) distribution vehicles conditions and maximum load

c) demand information not clear

d) influencing transportation routes

e) demand emergency degree is different

f) information network damaged

non-affected area storage scheduling

able to be estimated on the spot (not very accurate)

receive information through other ways

V. CONCLUSION AND PROSPECT

Timely and reasonable distribution of resources is the fundamental guarantee of emergency management, and it is important to establish perfect emergency management support system. This paper focuses on unexpected emergencies, uncertainty, scarce relief material and other characteristics, putting forward that in the process of treating the emergency, in order to effectively obtain the necessary relief materials in the shortest possible time, based on using traditional distribution strategy, implementing transshipment among different affected points, through improving service levels to accelerate the speed of disaster control, that is, realizing the emergency logistics distribution strategy combining vertical supply chain integration and horizontal integration of affected area material. Since the implementation of transshipment policy requires advanced information systems for support, so in this paper, we state that the distribution strategy should be performed on the premise that the emergency logistics center should grasp distribution of resources in each affected point and the development of epidemic, to realize relief material scheduling through coordination and command of various disaster points.

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