

Study of the Impact of Climate Change on Logistics and Warehouse Management

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Abstract

The global climate is constantly changing, which brings a certain impact on the warehouse management of logistics enterprises. With the rising global temperature, extreme weather time is frequent, which has a great adverse impact on the enterprise warehouse management. And warehousing is one of the important links of commodity circulation, plays an important role in the logistics system, based on this, the impact of climate change is analyzed and some countermeasures are proposed.

Keywords

Climate Change; Warehouse Management; Impact.

1. Introduction

Climate change is a huge challenge facing mankind in the 21st century that cannot be ignored. With the continuous emission of greenhouse gases, the global climate problem is constantly highlighted, and climate change has led to record-breaking meteorological disasters, such as fires in the Amazon rainforests and the collapse and melting of Antarctic icebergs in the whole world; meanwhile, in our country, heavy rainstorms in Zhengzhou, flooding events in Shanxi, and the melting of the glaciers in the Himalayas have caused great disasters and losses to the society and people have caused great disasters and losses.

China attaches great importance to coping with global climate change. On October 27, 2021, the Information Office of the State Council issued a white paper on "China's policies and actions to cope with climate change," which fully improved people's importance and urgency to climate change, clarified the specific requirements and action plans for China to cope with climate change, and showed China's determination to cope with climate change, which also indirectly reflected the urgent need to solve this problem.

Modern warehousing management plays a very important role in the daily activities of enterprises with its strong functions. In all warehousing systems, China's logistics warehousing capacity is still in the state of manual management or semi-manual management, and the degree of automation needs to be improved, which leads to the obvious impact of climate change in the process of warehousing.

In the context of climate change, the impact of climate change on warehouse management has gradually deepened, and the planning of existing warehouse management methods should also adapt to the requirements of low-carbon development concepts. It can be seen that the study of the impact of climate change on logistics warehouse management is of great significance.

2. Related Literature

2.1. Research Related to Climate Change

Vajjarapu Harsha et al. (2021) believed that extreme rainfall and inadequate flood diversion infrastructure lead to urban floods. The comprehensive adaptability index (CAI) method is used to evaluate the adaptability of urban transportation system to urban flood disaster with exposure, susceptibility and resilience. At the same time, the analytic hierarchy process (AHP) is used to estimate the weight of the index, and the consistency test is carried out to evaluate the validity of the weight.

Cheng Chen et al. (2020) argued that climate change and extreme weather pose a real threat to transportation infrastructure and suggested some countermeasures, i.e., changing the pavement type from asphalt concrete to cement concrete; raising the road base when roads are reconstructed or repaired; and installing more drainage facilities to improve the surface drainage system.

Song Yuanyuan et al. (2023) analyzed the interrelationship between the transportation sector and climate change in China from two perspectives: mitigation and adaptation, i.e., transportation generates greenhouse gas emissions, which have a certain impact on climate change, and climate change affects the safe operation of the transportation system.

2.2. Research Related to Warehouse Management

Atieh (2016) investigated the impact of warehouse management systems on supply chain performance that provides less resource workload, more efficient and reliable inventory management systems. The supply chain procedures implemented in the warehouse were reviewed before customizing the software that could handle the necessary transactions. The layout of the facility was also examined and a production station was introduced in the warehouse, which resulted in a better and optimized use of warehouse space.

Guo Yuzhi et al. (2022) first classified orders into ABC using a two-dimensional four-quadrant method dividing the two dimensions into four quadrants. Then, materials are stocked according to the ABC orders; storage in the warehouse is also based on the ABC orders and their weight and characteristics.

Luan Yufei (2022) that radio frequency identification technology can effectively promote the construction of intelligent information warehousing system, and, portable radio frequency identification system will certainly be the main development direction of intelligent warehouse management system.

3. Path Analysis of the Impact of Climate Change on Warehouse Management

Increased precipitation events, the intensity and frequency of hurricanes, heat waves, droughts, coastal erosion and flooding, and sea level rise are all effects of the earth's changing climate. These events can severely impact the construction, maintenance, and operation of warehousing activities for logistics companies; however, the long-term stresses associated with these climate shifts are often not factored into warehousing management, resulting in a variety of adverse impacts on warehousing management as described below.

3.1. Impact on Internal Storage

3.1.1. Increased Warehousing and Storage Workload

China is a sensitive area for global climate change and has a significant impact on it, with a rate of warming significantly higher than the global average over the same period. From 1951 to 2020, the annual average surface temperature in China showed a significant upward trend, with

a rate of warming of 0.26°C/decade. The last 20 years have been the warmest period since the beginning of the twentieth century, and of the 10 warmest years since 1901, except for 1998, the remaining nine occurred in the twenty-first century, with a marked increase in extreme heat events.

Extremely high temperature weather conditions for cold chain warehousing companies need to increase the amount of capital for refrigeration equipment, if not with the reality of the external environment and quickly make countermeasures, will increase the amount of tasks in warehousing activities. When the transportation is not smooth, the accumulation of goods in the warehouse is too much, in order to prevent the damage of the goods, it is necessary to increase the protection and management of the goods, the workload of the management personnel and the number and quantity of related equipment requirements will be increased accordingly.

3.1.2. Increase in the Classification of Combined Orders Or Individual Order Splits in Warehouses

Weather shocks can affect food production and ultimately increase the risk of human illness and death, reducing the productivity of a country or region's labor force. Over the past 20 years, there have been about 6,500 weather-related disasters around the globe, with an estimated 606,000 deaths, with China, India and Asia, including Bangladesh, accounting for more than half of the overall death toll.

After the goods are produced, it is necessary to classify the goods for different orders and different customers, and to classify and divide the goods that are not separated into individual orders, which requires the warehouse to have enough space to accommodate the goods of different orders and enough related equipments to operate normally in the warehouse. Because of the accumulation of goods and lack of capacity caused by climate change, weather shocks will lead to a reduction in the number of warehouse workers, a decline in labor productivity, and gradually increase the difficulty in the process of warehousing order sorting and individual order splitting.

3.2. Impact on the Outside of Storage

3.2.1. Obstruction of Logistics Storage and Transportation

Today's rapid development of e-commerce, commodity trading in the country as well as the world to carry out rapid, making the logistics enterprise in the rapid development of the new era, the production of goods can not be traded in the market in a timely manner, it is necessary to store goods through warehousing for storage and custody of such roles. China's annual precipitation increased by an average of 5.1 millimeters per decade, the time of heavy precipitation increased enhancement, in 2021 a total of 83 national stations in the country continuous precipitation exceeded the historical extreme, Jinzhong, Zhengzhou and other places due to the impact of heavy precipitation affected population has exceeded one million.

Climate change triggered by snowstorms, floods, road damage and other issues, resulting in poor logistics and transportation, limiting the logistics and transportation capacity, the increase in rainfall and freight volume inversely proportional to the annual June and July in the middle of June and late June will be more than the first half of June, the freight volume fell by 6% and 15% respectively, the increase in orders and the logistics and transportation of the lack of smooth and gradually accumulate contradictions, increase the cost of circulation, the logistics and transportation of enterprise pressure continues to increase. The pressure of enterprise logistics and transportation is increasing.

3.2.2. Influencing Price Strategies

Warehousing can effectively link production to consumption of the entire logistics business activities, when warehousing activities can be carried out normally, warehousing can play its

role in improving economic efficiency, to achieve the product can be in strong demand in advance of the time or in time to enter the market, improve the value of the product; but nowadays climate change continues to affect the warehousing activities, our country a certain occurrence of low-temperature, rain, snow, ice and freezing extreme natural disasters directly lead to each Regional traffic collapse, 21 highways totaling nearly 40,000 kilometers of roads are not smooth, tens of thousands of cars and people stranded. The selling price of meat, fruits and vegetables and other foodstuffs sent to the place has risen linearly, and consumers are selling them at a higher price, and the commodities that were originally to be sent to the place are all stagnant, resulting in the operation of the company that dealt with them at a low price to generate a huge loss.

Problems such as poor transportation and transit disruptions caused by climate change prevent products from reaching the market at the optimal time, making it necessary for companies to make new price adjustments, thus affecting the product's original pricing strategy.

3.2.3. Reduced Sensitivity of Warehousing to Market Information Sensing

Originally, enterprises could reflect the increase and decrease in demand for products in a timely manner based on the amount of warehousing and storage, as well as the size of market competitiveness, providing more accurate and less costly information to enterprise decision-makers about the market. However, due to the impact of climate change, the transportation link is blocked, the warehouse in and out of the warehouse is slowed down, part of the severely affected areas to stop the in and out of the warehouse operations, warehousing activities have been affected by a certain degree of impact on the volume of business has dropped significantly, the inventory turnover rate decreased significantly, resulting in the impact of the accumulation of goods and the reduction of the factors are not only the market demand, and will produce a certain degree of lagging, reducing the sensitivity of the sensing of market information, resulting in the enterprise can not accurately obtain information to adjust production. accurately obtain information to adjust production.

4. Suggestions Related to Enterprises' Response to Climate Change

4.1. Improve the Mode of Operation of Logistics Departments, Such as Logistics and Distribution, to Minimize Energy Consumption

On the one hand, enterprises use warehouse integration, localization of raw materials and other ways to reduce product logistics and distribution, in order to control the carbon footprint of the enterprise; on the other hand, enterprises with their own transportation fleet, but also through route optimization, improve the energy efficiency of the vehicle and the use of new fuels and other ways of energy saving and emission reduction, using more efficient modes of transport, such as railroads, waterways, etc., to reduce the use of road transport, thereby reducing greenhouse gas emissions. Through the integration of supplier warehousing, optimization of distribution and other ways to reduce the distribution vehicle "empty running", more use of waterways and rail freight and other ways to promote energy saving and emission reduction.

4.2. Improve the Corporate Governance Structure and Strengthen Low-carbon Management

All businesses have a responsibility and an obligation to strengthen their low-carbon management in response to the problems posed by climate change. Improve the leadership mechanism to address climate change issues, such as setting up special directors or committees to monitor climate change risks, and prevent possible regulatory constraints, reputational and legal risks in advance. In specific management, integrate the organizations related to climate change that were originally scattered in multiple functional departments through cross-departmental management meetings, and actively attract employees to participate in low-

carbon actions through role models, employee training, and publicity activities. Enterprises let the public know their specific emission status and the measures they have implemented to reduce emissions through the publication of annual social responsibility reports or the implementation of carbon disclosure programs.

4.3. Optimize the Scientific Layout of Storage

In order to cope with the challenges posed by climate change, the utilization efficiency of the internal space of the warehouse must be effectively improved, therefore, the layout of the warehouse should be scientifically and reasonably arranged according to the different frequency of local disasters, combined with the business needs and development strategy of the enterprise, and combined with the actual use of warehousing, rules and standards and other factors, so as to reduce the losses caused by the impact of climate change.

4.4. Improvement of Personnel Quality and Emergency Response Capacity

Improve the comprehensive quality of warehouse management personnel, training their ability to cope with climate disasters, first of all, can reduce the losses caused by disasters, and secondly, can also strengthen the efficiency of daily warehouse management. With the deepening of the impact of climate change, and logistics companies are becoming more and more competitive, the competition for high-tech and high-quality logistics personnel is even more intense. In this context, enterprises should take more initiative to cultivate and improve the warehouse personnel, training related emergency response capabilities, improve the comprehensive quality of management personnel, strengthen the cultivation of employees' awareness of environmental protection, promote the concept of environmental protection, and encourage employees to take environmental protection measures to jointly cope with climate change.

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