

# Natural Disasters and Global Supply Chain Risks: China's Manufacturing Response Strategies

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**Abstract:** This article focuses on the risks that natural disasters pose to the global supply chain and the response strategies of Chinese manufacturing. Firstly, it elaborates on the various risk manifestations that the global supply chain faces under the impact of natural disasters, including production disruptions, logistics obstructions, and imbalances in market supply and demand. Then, the mechanism by which natural disasters affect the global supply chain was analyzed, such as the vulnerability of geographical distribution, the complexity and interdependence of the supply chain, etc. Then, it delved into the position of "Made in China" in the global supply chain and its characteristics affected by natural disasters. Finally, specific strategies for Chinese manufacturing to deal with global supply chain risks caused by natural disasters were proposed from aspects such as strengthening supply chain resilience construction, promoting diversified supply chain layout, enhancing scientific and technological innovation capabilities, and strengthening international cooperation, aiming to provide theoretical support and practical guidance for Chinese manufacturing to maintain stability and sustainable development in the global supply chain.

**Keywords:** Natural Disasters; Global Supply Chain Risk; Made in China; Coping Strategies

## 1. Introduction

Driven by the wave of globalization, the global supply chain has been deeply integrated, and the interdependence of economies among countries has reached an unprecedented height. This close connection enables resources to be optimally allocated on a global scale, greatly enhancing production efficiency and allowing consumers to

enjoy a more diverse range of low-cost products and services. As a major manufacturing country in the world, China holds a pivotal position in the global supply chain, thanks to its well-developed industrial system, abundant labor resources and continuously improving technological level [1].

However, in recent years, natural disasters have occurred frequently, bringing huge shocks and risks to the global supply chain. Natural disasters are unpredictable and highly destructive, such as earthquakes, floods, hurricanes, droughts, etc. They can cause severe damage to production facilities, transportation infrastructure, etc. in a short period of time, leading to production disruptions, logistics disruptions, and subsequently triggering a series of problems such as market supply and demand imbalances. [2] For instance, the 9.0-magnitude earthquake that struck the northeastern waters of Japan in 2011 and triggered a tsunami dealt a devastating blow to the manufacturing industry in the region. Many factories of enterprises in the automotive and electronics industries were submerged or damaged, and production came to a long-term standstill. As Japan holds a key position in the global supply chain of automotive and electronic components, its production disruptions quickly spread worldwide, leading to shortages in the global supply of automotive and electronic products, price hikes, and causing huge losses to many related enterprises [3].

In-depth research on the relationship between natural disasters and global supply chain risks, and proposing response strategies for Chinese manufacturing, not only helps Chinese manufacturing enterprises enhance their disaster resistance capabilities and market competitiveness, ensuring the stable operation and sustainable development of enterprises, but also contributes to maintaining the stability of the global supply chain and promoting the healthy development of the global economy.

Therefore, this article holds significant practical significance and theoretical value.

## **2. The Manifestation of Global Supply Chain Risks under Natural Disasters**

### **2.1 Risk of Production Disruption**

The direct damage to production facilities caused by natural disasters is the main reason for production disruptions. Take earthquakes as an example. A powerful earthquake can instantly destroy the buildings, production equipment and infrastructure of a factory, causing the enterprise to come to a standstill. The 8.1-magnitude earthquake that occurred in Nepal in 2015 caused severe damage to the country's manufacturing industry. The factories of many textile factories, handicraft processing factories and other enterprises collapsed, their production equipment was damaged and raw materials were buried, resulting in a complete interruption of production. As Nepal has a certain international market share in some characteristic product fields, the disruption of its production not only affected the domestic economic recovery but also had an impact on the global supply of related products [4].

Floods are also common natural disasters that cause production disruptions. In 2021, some parts of Europe suffered from rare flood disasters, affecting many manufacturing enterprises in countries such as Germany and Belgium. The flood inundated the factory, causing short circuits in electrical equipment and rust and damage to mechanical equipment, and production could not proceed normally. For instance, some auto parts suppliers in Germany, due to the flooding of their factories, experienced a disruption in parts supply, forcing downstream automakers to adjust their production plans, reducing production or even halting operations [5].

### **2.2 Risk of Logistics Disruption**

The damage to transportation infrastructure caused by natural disasters can seriously affect logistics transportation, leading to disruptions in logistics. Roads are important channels for logistics and transportation. Disasters such as earthquakes and floods may cause roads to collapse, break or be submerged, making them impassable. In 2017, a wildfire broke out in California, USA. The fire spread rapidly, destroying a large number of roads and Bridges

and causing the logistics transportation to come to a standstill. Many enterprises' raw materials cannot be transported to the factory, and their products cannot be delivered to customers in a timely manner, which has affected the normal production and sales of the enterprises [6].

Ports and airports are important hubs for international trade logistics, and natural disasters can also have a significant impact on them. Disasters such as hurricanes and tsunamis may cause damage to port facilities, submergence of docks, grounding of ships, destruction of airport runways, and damage to aviation equipment, etc. In 2017, Hurricane Maria hit Puerto Rico. The runway of SAN Juan International Airport on the island was severely damaged, and flights could not take off and land normally. The port was also closed due to the storm surge, causing logistics and transportation disruptions for several weeks and resulting in huge losses to the local import and export trade.

### **2.3 Risk of Imbalance between Market Supply and Demand**

Natural disasters can damage production facilities and logistics transportation, leading to a reduction in market supply. At the same time, disasters may also affect consumers' demands and purchasing power, leading to changes in market demand. For instance, after a natural disaster occurs, people's demand for daily necessities such as food, drinking water and medicine will increase sharply, while the demand for some non-necessities will decrease. If the supply chain fails to adjust production and supply in a timely manner, there will be an imbalance between market supply and demand, leading to problems such as rising prices and social instability.

### **2.4 Financial Risks**

Natural disasters can cause huge economic losses to enterprises, affecting their financial status and debt-paying ability. This may lead to difficulties in enterprise financing, a decline in credit ratings, and an increase in the financial risks of enterprises. At the same time, natural disasters can also affect the compensation capacity of insurance companies, leading to instability in the insurance market. For instance, Hurricane Katrina in the United States in 2005 caused huge economic losses. The compensation amount paid by insurance companies reached tens of billions of dollars, leading to the

deterioration of the financial situation of some insurance companies and even their bankruptcy.

### **3. The Mechanism by which Natural Disasters Affect the Global Supply Chain**

#### **3.1 Vulnerability of Geographical Distribution**

The various links of the global supply chain are distributed in different regions, and the occurrence of natural disasters has regional characteristics. Some regions are more vulnerable to natural disasters due to factors such as geographical location and climatic conditions. For instance, coastal areas are vulnerable to disasters such as typhoons and tsunamis, while seismic zones are prone to damage from earthquakes. If the key links of the global supply chain are concentrated in these vulnerable areas, once a natural disaster occurs, it will have a serious impact on the entire supply chain.

#### **3.2 The Complexity and Interdependence of the Supply Chain**

Modern global supply chains are becoming increasingly complex, involving enterprises and links in multiple countries and regions. Enterprises are interdependent. A problem in one link may trigger a chain reaction and affect the stable operation of the entire supply chain. For instance, a car manufacturer's parts suppliers may be distributed across multiple countries around the world. If a natural disaster occurs in the region where one of the suppliers is located, causing a disruption in parts supply, it will affect the production progress of the car manufacturer and, in turn, the stability of the entire automotive supply chain.

#### **3.3 Information Asymmetry and Coordination Difficulties**

In the global supply chain, there exists the problem of information asymmetry among enterprises at all links. Enterprises often only have a good understanding of their own production and supply situations, and have relatively little knowledge of the information of upstream and downstream enterprises. This makes it difficult for enterprises to grasp the overall situation of the supply chain in a timely and accurate manner when natural disasters occur, and it is hard for them to carry out effective coordination and response. For instance, after a natural disaster occurs, suppliers may not

be able to promptly inform manufacturers of the supply of raw materials, and manufacturers may also be unable to adjust their production plans in a timely manner, resulting in production chaos and waste of resources.

### **4. The position of "Made in China" in the Global Supply Chain and its Characteristics Affected by Natural Disasters**

#### **4.1 The Position of Made in China in the Global Supply Chain**

China is the world's largest manufacturing country, with a complete industrial system and huge production capacity. "Made in China" holds a significant position in the global supply chain and is a major producer and exporter of many products worldwide. For instance, China's electronic products, textiles, mechanical equipment, etc. have a relatively high share in the global market. The stable operation of "Made in China" is of great significance to the stability of the global supply chain and the development of the global economy.

#### **4.2 Characteristics of Chinese Manufacturing Affected by Natural Disasters**

##### **4.2.1 The regional influence is obvious**

China has a vast territory, and the climatic conditions and geographical environments in different regions vary greatly. The occurrence of natural disasters also has distinct regional characteristics. For instance, the eastern coastal areas are prone to disasters such as typhoons and heavy rain, while the southwestern regions are vulnerable to earthquakes and landslides. The extent to which manufacturing industries in different regions are affected by natural disasters varies. In some coastal areas, manufacturing industries such as electronics and automobiles are more severely affected by typhoons and heavy rain, while in some inland areas, manufacturing industries such as energy and raw materials are more severely affected by droughts and floods.

##### **4.2.2 The transmission effect of the industrial chain is significant**

The industrial chain of China's manufacturing industry is relatively long, and the correlation between upstream and downstream enterprises is relatively high. Once an enterprise in a certain link is affected by natural disasters, it will be passed on to other enterprises through the industrial chain, affecting the stable operation of

the entire industrial chain. For instance, during the torrential rain disaster in Henan Province in 2021, the production of some auto parts suppliers was severely affected, resulting in the disruption of parts supply for downstream auto manufacturers and delays in production progress.

#### 4.2.3 It has a significant impact on exports

China is a major global exporter, and the products of many manufacturing enterprises are mainly targeted at the international market. The occurrence of natural disasters may affect the production and logistics transportation of enterprises, resulting in products not being exported on time and affecting the international market share and economic benefits of enterprises. For instance, during the Wenchuan earthquake in 2008, some electronic information enterprises in Sichuan were severely affected, and the export of their products was to some extent hindered.

### 5. Strategies of Chinese Manufacturing in Responding to Global Supply Chain Risks Triggered by Natural Disasters

#### 5.1 Strengthen the Construction of Supply Chain Resilience

Enterprises should establish a natural disaster risk early warning mechanism, strengthen the monitoring and analysis of meteorological, geological and other disaster information, promptly grasp the possibility of disaster occurrence and the scope of impact, and formulate emergency plans. At the same time, increase investment in supply chain infrastructure, enhance the seismic, flood and fire resistance capabilities of factories, and improve the reliability and safety of logistics and transportation equipment. In addition, optimize inventory management, appropriately increase the inventory of key raw materials and components in areas prone to natural disasters, establish strategic inventory alliances with suppliers, and achieve inventory information sharing and collaborative management.

#### 5.2 Promote Diversified Layout of the Supply Chain

Geographically, enterprises should disperse the key links of the supply chain to different regions to reduce their reliance on a single region. Production bases and warehousing centers can be established in different regions within the

country, and investment layouts can be made in internationally in areas with political stability and fewer natural disasters. In terms of suppliers, we should expand the supplier channels, increase the quantity and variety, strengthen management and evaluation, and select suppliers with good reputation and strong disaster resistance capabilities to establish long-term and stable cooperative relationships. At the market level, we should actively explore both domestic and international markets, especially intensify efforts to explore emerging markets, diversify market risks, and enhance market adaptability and competitiveness.

#### 5.3 Enhance Scientific and Technological Innovation Capabilities

Enhance the capacity for scientific and technological innovation. Promote the development of intelligent manufacturing, utilize automated production lines and intelligent logistics systems to enhance the production efficiency and flexibility of enterprises, reduce production costs and energy consumption, and enable rapid production recovery and adjustment in the event of disasters, thereby minimizing the impact on enterprise production. Strengthen the application of information technology, establish a supply chain information management platform, and use the Internet of Things to grasp the transportation status and inventory of raw materials and products in real time. Adjust production and supply plans promptly to enhance the transparency and coordination of the supply chain. Carry out research and development of disaster response technologies, such as developing new materials and equipment for earthquake resistance, flood control and fire prevention, to enhance the disaster resistance capacity of buildings and infrastructure. Develop efficient disaster rescue equipment and technologies to enhance the efficiency and effectiveness of disaster rescue efforts.

#### 5.4 Strengthen International Cooperation

To enhance cooperation with international organizations, China should actively participate in the activities of international organizations such as the United Nations and the World Trade Organization, take part in the formulation of international rules and global supply chain governance, keep abreast of the dynamics and trends of the international supply chain in a timely manner, obtain international support and

resources, and jointly address global challenges such as natural disasters. Carry out international production capacity cooperation, jointly build industrial parks and production bases with countries along the routes, achieve complementary industrial advantages and coordinated development, expand overseas markets, reduce domestic market risks, and help countries along the routes improve their industrial levels and disaster resistance capabilities. Strengthening cooperation with international enterprises, Chinese manufacturing enterprises should learn from and draw on advanced international management experience and technologies, enhance their core competitiveness and disaster resistance capabilities, expand international markets, integrate into the global supply chain system, and achieve mutual benefit and win-win results.

## 6. Conclusion

Natural disasters have posed huge risks and challenges to the global supply chain. As an important part of the global supply chain, "Made in China" has also been affected to varying degrees. To address the global supply chain risks triggered by natural disasters, Chinese manufacturing needs to adopt a series of effective strategies, including strengthening supply chain resilience, promoting diversified supply chain layout, enhancing technological innovation capabilities, and reinforcing international cooperation. Through the implementation of these strategies, "Made in China" can enhance its disaster resistance and market competitiveness, maintain stability and sustainable development in the global supply chain, and make greater contributions to the recovery and development of the global

economy. Meanwhile, the government should also play a guiding and supportive role, formulate relevant policies and measures, and create a favorable policy environment and market conditions for "Made in China" to cope with global supply chain risks.

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