

Impact of Global Climate Change on Maritime Logistics

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ABSTRACT

Purpose

The port of Bremerhaven is the second largest port in Germany and belongs to the Federal State of Bremen. The global climate change affects Bremen directly and indirectly. Extreme weather events, like heavy rainfall, inland river floods and heat waves already have direct effects on the maritime industry in Bremen. Besides these direct effects, an event which occurs upstream in the global supply chain can lead to indirect consequences for Bremen, situated at the end of the chain. For instance, in 2016 the most imported good in Bremerhaven was coffee which is imported mainly from Brazil, Vietnam and Honduras. According to the Global Climate Risk Index Vietnam was one of the most endangered countries in terms of extreme weather events in 2016 (Eckstein *et al.*, 2016). Thus, disturbances at the source could affect the import flows to Bremen.

Besides these extreme weather events which already affect maritime logistics also the long term effects of the global climate change have to be considered (Rupik and Samui, 2018). In detail, the impacts of sea level rise and the increase in the frequency and intensity of these extreme weather events have to be analysed for a proper supply chain risk management. Therefore, in 2017 the project “BREsilient – Resilient Future City of Bremen” was started in order to increase the resilience against the impact of the global climate change (BREsilient, 2018). One of the work packages aims at the development of adaptation measures against these impacts for the maritime logistics domain. As a first step, this paper gives insight into the current situation on supply chain risks caused by global climate change. These results were retrieved from interviews with different actors of the maritime logistics domain.

Methodology

In order to analyse risks caused by today’s extreme weather events as well as long term effects by global climate change the following methodology was defined. First, import trade flows to the port of Bremen and Bremerhaven were analysed in order to identify imported goods which are endangered by climate change. Secondly, a questionnaire for a semi-structured interview was created featuring experiences of today’s extreme weather events and expectations for the climate change for 2050. Next, different interviewees were identified in order to cover (i) different parts of logistics in Bremen/Bremerhaven and (ii) importers of identified goods. Finally, the interviews were carried out and the statements were analysed.

Findings

In total 11 interviews were carried out. One main question in the interview was on experiences on different effects caused by extreme weather events. Table 1 shows the number of respondents who already were affected by these events. Most interviewees experienced

transport delays which were caused by the non-usability of transport routes. Also damaged company's infrastructure, damaged buildings and damaged vehicles were often reported.

Table 1 Number of respondents in Bremen who already experienced consequences by extreme weather events

Effects of extreme weather events	Count
Damaged buildings	5
Flooding of company's premises	2
Damaged vehicles	5
Damaged goods	1
Transport delay (non-usability of transport routes)	10
Damaged company's infrastructure	6
Energy supply breakdown	1
Disruption of loading/unloading	1
Increased demand for electricity	1
Health impairment	2
Loss of customers	2
Additional costs	1

In the following section the most important findings from the interviews are clustered according to different sectors in the maritime industry:

Ports and vessels

During heatwaves, the cabins of straddle carriers can be unbearably hot, which can lead to health impairment of the drivers. Heat could also weaken the asphalt on the port's premises especially near buildings. Strong winds in combination with high tides can hinder port operations. During storms, the port captain has to stop operations in the whole port. Moreover, vessels can be delayed due to bad weather conditions.

Inland waterway transport

The river Rhine is often affected by low waters. Consequently, depending on the draft some vessels cannot sail and shipping lines have higher costs for alternative transports. Besides low waters in summer also high water levels in spring hamper this transport mode.

Rail transport

With roughly 700 arrivals and departures, the port of Bremerhaven heavily relies on its rail connection. Any disturbances of this mode of transport can lead to significant problems in port operations. In the past, rail services were disrupted by trees and branches fallen on overhead wiring. Also, bush fire can lead to severe disruptions.

Salt spray is another incident which is special for the region: Due to a storm on the sea, sea water is swirled up, taken by the wind and the salt covers insulators of the overhead wiring. This leads to severe interruptions in rail services. In 2018 the rail service between Bremen and Bremerhaven was cancelled for several days due to salt spray.

Health impairment due to heat is a problem which especially affects shunters. Another aspect is maintenance on tracks, which has to stop at temperatures of 56°C or higher. In addition, welding is forbidden if there is a risk of fire. These restrictions can hinder maintenance and can have an impact on operations. Due to these incidents, some customers already switched to other transports modes in order to avoid delays and cancellations.

Road transport

In 2018 the highway between Bremen and Bremerhaven was temporarily closed because of a sandstorm. Another incident type is caused by heavy rainfall, which can lead to flooded streets and damaged infrastructures.

Manufacturing and warehousing

Storms in South- or West-Germany can lead to shortages in resources for production in Bremen. This can lead to a stop of production, especially for just-in-time processes. Manufacturing processes can also be affected directly: Lacquer processes cannot be carried out in longer periods with high temperatures and low humidity. In the field of warehousing, it was reported that high temperatures for longer periods can hamper the cooling process in cold stores.

Research limitations/implications

Existing research in the field of the assessment of the impact of global climate change on maritime logistics is quite limited. This paper gives a first insight on the risks, effects and expectations regarding the development until 2050 in this domain. However, the mitigation of these risks is not addressed. Consequently, future research should focus on the development of adaption measures in order to cope with the effects of these risks.

Practical implications

The results clearly show that the global climate change already has negative impacts on maritime logistics. Therefore, practitioners have to be informed of these risks. The results from this paper indicate which risks in this domain have to be tackled for a proper supply chain risk management.

Original/value

Experiences of practitioners in the field of extreme weather events and global climate change and their consequences on maritime logistics are presented. This paper helps to close a gap in a field with limited existing research and also indicates space for future research tasks.

Keywords: Supply chain risk management, maritime logistics, global climate change, extreme weather events

REFERENCES

- BREsilient (2018), "BREsilient project description", available at: https://bresilient.de/wp-content/uploads/2018/05/BREsilient_Flyer_englisch_web_K1.pdf (accessed 02 May 2018).
- Eckstein D., Künzel V. and Schäfer L. (2018), *Global Climate Risk Index 2018, Who Suffers Most From Extreme Weather Events? Weather-related Loss Events in 2016 and 1997 to 2016*, Germanwatch.
- Ruppik, D., Samui, K. (2018), "Globale Erwärmung stellt Häfen vor Herausforderung", *Schiff & Hafen*, Nr.6, June 2018, pp. 52-53.