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Climate Change and Increasing Risks to the Global Food Supply Chain

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For many of our favorite foods and staples, we depend on a globally interconnected supply system that involves ships, rail lines, trucks, canals, ports, highways, and distribution and storage centers. Sesame from Tanzania, vanilla from Indonesia, blueberries from Chile, and Scotch from Scotland are just a few examples of food and beverage items that are transported great distances before getting to our grocery or restaurant. However, this transportation system is getting riskier because of a changing climate. Floods, storm surges and more extreme weather are taking an increasing toll on a transport system and infrastructure that was not designed in anticipation of a changing climate.

Risks are not increasing just for products moved great distances. Hurricane Sandy brought food distribution in New York City to a standstill and droughts which are expected to occur more frequently encumbered barge traffic along the Mississippi River in 2012. Recent high water levels on the Mississippi are having a similar effect since barges are not able to pass under some bridges. These disruptions not only affect the transport of food products but also the fertilizers and other agricultural products needed to grow crops. A recent article in the New York Times reports on some of the impacts the floods have had on barge traffic (Smith 2019). Extreme weather events interrupt not only transport but also electricity service, posing additional threats to food storage and safety.

The globalization of the food supply chain continues to increase at a rapid pace as a result of continued improvements in transportation and production technology. Globalization of the food supply chain means greater access to more and more food producers around the world. Food operations for example, have benefited greatly from this through greater availability of counter-season supplies, increased product consistency and quality, reduced costs due to increased competition, and more. Despite all the benefits that globalization has afforded

the food industry, it is becoming evident that these benefits are being threatened by global climate change.

Thus, there is a growing critical need for those in the business of food to be fully aware of the risks posed by a changing climate along the entire global supply chain. For example, many in the food industry are beginning to have open and intentional discussions about the impact of global climate change on their businesses ranging from strategic decisions related to consumer demand to tactical decisions about cost and supply. Some are reporting increases in costs as a result of climate change-related events and greater difficulty in predicting how long crops will be available or when they will be harvested.

Critical disruptions in the global food system, have been linked to weather and climate. For example, Resilinc, a company that tracks data on supply chain disruptions, recorded 1,069 disruptive events across the globe in 2018. Over 300 of these events directly affected the ability to maintain the continuity of supply chains, and extreme weather was found to be the most impactful type of disruption. One study shows that the number of extreme weather events has increased 40-fold in the last century (Streche and Kumar, 2009).

Take for example the port of Shanghai which is the busiest port in the world by volume. It moves more shipping containers than the top 5 ports in the U.S. combined. China itself moves over 40% of the volume of goods as the top 50 ports in the world. China imports large quantities of food to keep up with demand within the country, and numerous large multinational food companies have branches in Asia, particularly in Shanghai and the Yangtze River Delta. These include Mars, Mondelez International, General Mills, Nestle, PepsiCo, Cargill, Group Danone, Coca-Cola, and Hershey's. The region, however, has experienced a 12% - 15% increase in the intensity of typhoons. Category 4 and 5 typhoons have doubled and tripled in the last 40 years. These more intense typhoons are reaching land due to warming ocean surface temperatures (Mei and Xie, 2016), a trend that is expected to continue with increasing greenhouse gas emissions.

The Panama Canal is critically important to international shipping but has been identified as one of several global chokepoints. Chokepoints are defined as, "critical junctures on transport routes through which exceptional volumes of trade pass" (Bailey and Wellesley, 2017, p. iv). In 2015, container ships were stuck at both ends of the Panama Canal, leading to delays in shipments up to 10 days. The delays were caused by severe drought, which reduced water levels in the lakes that feed the canal's locks. In addition to drought, however, severe storms also threaten the existing infrastructure of the canal, and heavy downpours can shut down the canal.

According to a 2017 report by the United Nations Conference on Trade Development, the distribution of food and food products is further complicated by the fact that roughly one-fifth of the port organizations surveyed rely solely on road transport to move shipments inland, making them dependent on the resilience of road networks. Less than half of these ports use a combination of road and rail, while only a third utilize road, rail and inland waterways to move shipments inland.

Additional research indicates a general awareness of the impacts climate change has on

supply chains and networks; however, a lack in knowledge still exists as to the most effective ways to manage risk from these impacts. More development of policies that support adaptive measures within transport, including infrastructure improvements, and energy backups are needed.

There are three main strategies for reducing risk within the supply chain. They are, use multiple sources for raw materials; choose suppliers that have proactive plans in place for disruption; have emergency inventory options in place. However, greater communication and cooperation within and among supply chains are needed in order to adapt to and mitigate the risks of climate change.

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