

Supply Chain Impact of 2014 Ebola Outbreak

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EBOLA



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1. Executive Summary

The current Ebola outbreak in West Africa is the largest such epidemic in recorded history, with over 4,500 deaths attributed to the infection so far. In addition to the human toll, the current outbreak is having substantial negative impacts on supply chains within both affected and non-affected countries. As the spread of the current outbreak widens, governments and private industry are implementing plans aimed at containing the advance of the virus, which in turn are likely to impact supply chains across the globe.

As a by-product of measures taken by governments and the private sector, some industries are beginning to see their supply chains and operations in the region disrupted. Air traffic originating in or destined for West African states have been most significantly affected. International and regional carriers from various countries have chosen to suspend flights until the public health crisis is brought under control, subsequently affecting air cargo shipments to the region. In addition to air transport, several nations, including Argentina, Brazil, China, Panama, and the United States, are implementing new security measures for cargo vessels arriving from affected nations. While these measures range in severity, they underscore a trend in

which nations are laying increased scrutiny on links in supply chains that have crossed through Ebola-affected countries.

For importers in several nations, particularly in South America, companies should expect cargo vessels hailing or returning from West African nations to be significantly delayed. Several national health authorities, including those in Argentina and Brazil, are requiring that vessels arriving from affected regions remain offshore for the entire duration of the incubation period of the virus. These delays range from ten to 21 days, and will affect shipments regardless of security levels.

These heightened concerns over the spread of the Ebola virus will be particularly punishing for companies that do not properly secure their supply chains. Stowaways from the region are likely to cause the most severe disruptions if discovered, and entire vessels can expect to be delayed for days or weeks until health officials determine that a given stowaway and/or cargo vessel pose no health threat. If the governments of the affected nations fail to slow the rate of transmission, more drastic measures will likely be taken to quarantine the virus, thereby increasing the likelihood and severity of disruptions to the supply chain.

Affected Regions of 2014 Ebola Outbreak

Guinea:

Value of total exports - \$1.31 billion
Value of U.S. imports from Guinea - \$138.07 million

Liberia:

Value of total exports - \$928.8 million
Value of U.S. imports from Liberia - \$98.456 million

Nigeria:

Value of total exports - \$93.55 billion
Value of U.S. imports from Nigeria - \$11.984 billion

Sierra Leone:

Value of total exports - \$1.56 billion
Value of U.S. imports from Sierra Leone - \$41.815 million



2. Demonstrated and Potential Impact to Supply Chains

Ebola has had a marked impact on supply chains both in Africa and throughout the world. The outbreak disrupts supply chains in two primary ways: direct impacts of the disease on business (first-order impacts), and interruptions caused by countermeasures designed to stop the spread of the infection (second-order impacts). While the first-order impacts are largely concentrated in the affected West African nations, the imposition of additional security measures to contain the outbreak is causing delays for shipments of cargo throughout the world. All modalities are affected by these measures, though the majority of disruption impacting cargo truck transportation is occurring in Ebola-affected countries.

A growing number of nations worldwide are taking precautions to protect their citizens from the viral outbreak. Argentina, Brazil, China, Panama, the United States, and the United Kingdom are just a few of the countries implementing increased scrutiny on cargo shipments hailing from West Africa. These countermeasures take several different forms, varying by both modality and nation. The subsequent disruptions to supply chains on a global scale are felt most acutely by companies moving cargo by air or sea modalities, while business partners in West Africa are also noting delays for cargo shipments moved by truck.

2.1 Air Transportation

As public anxiety over the spread of Ebola continues to grow, governments and private sector actors are taking steps to limit the risk of exposure via air travel. Nigeria suspended flights by one airline in mid-August until the company established measures designed to contain the spread of the virus that were deemed acceptable by Nigerian authorities. The Ivory Coast government took more drastic measures, barring all flights from Guinea, Liberia, and Sierra Leone from landing at any of its airports. That ban has since been lifted, allowing trade between Ivory Coast and its West African neighbors to resume. In September, Senegal also stopped allowing aircraft coming from Ebola-stricken nations to land at any of its airports in order to safeguard the health of its citizens.

In addition to governmental actions, airlines are unilaterally restricting or suspending flights serving affected countries. Major airlines from Equatorial Guinea, Kenya, Nigeria, the United Arab Emirates, and the United Kingdom have restricted flights to the hardest hit nations. A major airline in France was forced to cancel flights to affected countries due to increasing pressure from flight crews concerned about being exposed to the virus. Currently, BSI has identified only two major international airlines which continue to serve Guinea, Liberia, and Sierra Leone, one which operates out of Belgium, and the other which is based in Morocco.

2.2 Ground Transportation

While the majority of disruptions to cargo truck shipments are recorded in Guinea, Liberia, and Sierra Leone, these impacts can have significant downstream effects on supply chains for manufacturers that rely on inputs from West Africa. At various points, land borders between the nations have closed and reopened, only to be closed again. At present, Liberia has only three border crossings to neighboring countries open, greatly restricting ground transportation. Authorities have deployed roadblocks in major transportation hubs, such as Freetown, Sierra Leone and Monrovia, Liberia, forcing cargo shipments to reroute or be subject to delays. Many of the nations neighboring the affected countries, such as Cameroon, Gabon, the Ivory Coast, and Senegal, have closed land borders with affected nations, including Nigeria. While there has been no documented transmission of Ebola via a cargo truck driver or shipment, the fear that such an incident can occur is fueling additional pushes for strong border controls in the region.

However, despite these efforts, the already-tenuous security situation is even more volatile following the outbreak of Ebola in West Africa. The three primary outbreak nations all experience significant amounts of cargo theft. BSI assesses that, as employees are out of work and curtailed trade creates shortages of essential goods, shipments are likely to face an increased threat of theft when transiting through Guinea, Liberia, or Sierra Leone. While Nigeria and Senegal are hotspots for cargo theft, it is unlikely that any marked increase in cargo theft will be noted in relation to the outbreak, as these countries have largely contained the infection and poor security has not been further deteriorated by the infection.

2.3 Sea Transportation

Supply chains reliant upon the movement of seaborne cargo to and from West Africa are likely to be significantly impacted, specifically delayed, by the outbreak of Ebola. Many nations, including Brazil, Panama, and the United States, are conducting inspections of cargo vessels arriving from West Africa and screening crew members for possible infection. Panama has taken the measures a step further, and is conducting inspections aboard each vessel that has stopped in West Africa during one of their last ten port-calls, causing several-hour delays to vessels transiting through the Panama Canal. The U.S. Coast Guard is inspecting vessels arriving at key ports, and the new policy is further exacerbating delays at several facilities, including the ports of Los Angeles and Long Beach. Additionally, the United States is now requiring vessels to announce their arrival at U.S. ports to the U.S. Coast Guard 96 hours in advance. Additionally, all vessels will be required to declare their cargo and disclose their last five ports of call to American officials. Any vessel arriving from Guinea, Liberia, or Sierra Leone will be flagged and crews that have recently or currently experiencing illness will require clearance by the CDC.

Brazil is not allowing vessels to dock or unload cargo at any ports until 21 days have passed since their last port call at an affected country. The 21 days allows for the longest recorded incubation period for the Ebola virus to manifest. In some countries, crews have refused to work on vessels destined for West Africa, and delays in shipments of rice from Thailand, for example, have resulted in crewmember fears of infection.

Other nations, such as Chile and Argentina, are following Brazil's lead and have imposed less-stiff inspections upon cargo shipments. Many of these policies were adopted in early September, shortly after an Ebola scare in Uruguay. In that incident, two stowaways were detected aboard a vessel arriving from Nigeria. The Coast Guard and port authorities conducted a full inspection of the vessel and arrested the two Nigerian nationals. While the stowaways were found to be free of infection, the incident highlights an important security risk.

The threat of a stowaway carrying Ebola on board a cargo vessel drastically increases the need for shipment security.

International fears over Ebola also make securing cargo vessels from stowaways an increasingly paramount priority for shipping firms. Vessels coming from Ebola-hit nations which discover stowaways can expect to experience severe delays, as nations are likely to quarantine vessels and crews should stowaways be discovered, thereby delaying the delivery of cargo for a potentially extended period of time. While Guinea, Liberia, and Sierra Leone do not face particularly high rates of human smuggling, more individuals may seek to illegally board cargo vessels as the situation in their home countries grow increasingly desperate.

Additionally, sea-borne cargo could be dramatically impacted if specific legislation targeting vessels flagged in any of the Ebola-hit countries is introduced. In particular, any legislation targeting Liberian-flagged vessels would prove quite disruptive, as Liberia boasts the world's second largest flagged fleet of ships. While the impact of any legislation of this kind would be far reaching, it is unlikely that such legislation would emerge due to its wide reach and limited positive effects.

2.4 Commodity Supply Chains and Affected Industries

In addition to first-order impacts on the movement of goods to and from West Africa, the current Ebola outbreak is also having a negative effect on the output of specific commodities that could have significant downstream effects for certain industries. The region as a whole possesses valuable natural resources such as oil, minerals, ores, and agricultural products. The output of some of these commodities is likely to shrink as the epidemic continues to spread, forcing firms which require these natural resources to seek alternative supplies from other parts of the globe, thereby driving up the cost of industrial inputs.

One of the most important raw materials exported from the region is oil. Nigeria's vast oil reserves have helped establish the country as Africa's largest economy, and any moderate or severe shock to Nigerian oil output would undoubtedly have global impacts. Although the country is viewed to have successfully contained the Ebola outbreak within its borders, a reemergence of the virus poses significant threats to a significant portion of the global supply of oil. In addition to driving up energy prices, tightened oil supplies could leave plastics and chemical companies searching for new sources of oil and oil-based products, a potentially time-consuming process.

In addition to oil, the West African nations currently battling EVD are important source countries for commodities like rubber and mineral ores. In particular, Liberia produces and exports considerable amounts of rubber to the United States and other nations, and hosts some of the world's leading rubber products companies. Because harvesting rubber requires relatively large labor forces, an outbreak among rubber workers could prove harmful to supplies if not managed properly. While a temporary reduction in rubber supplies from Liberia would likely be offset by international reserves in the short-term, shocks to the supply of rubber would likely occur if the Ebola virus spreads across rubber plantations unchecked.

Exported Commodities by Country

GUINEA

Major commodity: Aluminum ore



SPAIN

\$164 million of aluminum ore imported from Guinea, equaling 19.5 percent of aluminum ore exports



IRELAND

\$129 million of aluminum ore imported from Guinea, equaling 15.3 percent of aluminum ore exports



UKRAINE

\$128 million of aluminum ore imported from Guinea, equaling 15.2 percent of aluminum ore exports

LIBERIA

Major commodity: Rubber, rubber products



USA

\$92 million of rubber and rubber products imported from Liberia, equaling 45.3 percent of rubber-related exports



CANADA

\$31 million of rubber and rubber products imported from Liberia, equaling 15.5 percent of rubber-related exports



MALAYSIA

\$15.6 million of rubber and rubber products imported from Liberia, equaling 7.7 percent of rubber-related exports

SIERRA LEONE

Major commodity: Ores, slag, and ash

(*Sierra Leone's primary export is specifically iron ore, and China imports virtually all of Sierra Leone's iron ore exports)



CHINA

\$1.4 billion of ores, slag, and ash imported from Sierra Leone, equaling 91.1 percent of ores, slag, and ash exports



USA

\$27 million of ores, slag, and ash imported from Sierra Leone, equaling 1.8 percent of ores, slag, and ash exports



BELGIUM

\$25 million of ores, slag, and ash imported from Sierra Leone, equaling 1.7 percent of ores, slag, and ash exports

3 Assessment of Prevention Measures

While travel bans to and from Ebola-affected countries are considered largely ineffective and counterproductive to combatting the outbreak, public desire for perceived action against Ebola is likely to have an impact on trade for the foreseeable future. As more countries and companies restrict travel to and from affected areas, global health experts and other needed personnel are finding it increasingly difficult to reach the hardest-hit countries. Additionally, medical supplies necessary for health workers to perform their duties safely are having difficulty reaching those areas that need these supplies due to increasingly limited methods of cargo transportation to the region. The cumulative effects of these bans are having a negative impact on the already over-burdened healthcare systems in Guinea, Liberia, and Sierra Leone, preventing these countries from successfully containing the current outbreak.

As stated above, governments are coming under increased pressure to demonstrate active prevention measures. However, it is likely that these measures will have a limited impact on the containment of the Ebola virus. This is primarily due to the long incubation period for Ebola. Most experts agree that Ebola victims are not contagious until they become symptomatic. As a result, a person traveling with the infection may not show signs of a fever or other symptoms common among victims until days after they have traveled to another country. Despite the limited health benefits of screening measures, BSI assesses that countries will continue to implement certain procedures as confidence-building measures for the general public. Disruptions or delays to supply chains could become increasingly problematic if political pressure for more intensive screening procedures of cargo vessels and aircraft intensifies in the face of a worsening epidemic.

EBOLA VIRUS OVERVIEW

The Ebola Virus Disease (EVD) is an illness that can affect humans and non-human primates exposed to the Ebola virus. Although the disease is caused by a viral infection, there are no known antiviral medications capable of curing the disease. The virus is named after the Ebola River in the Democratic Republic of Congo, where the first known case of the disease was recorded. The virus is transmitted via close contact with the blood, organs, or other bodily fluids of an infected person or animal. The virus does not require a living host to survive, and there have been numerous recorded cases in which family members and health workers have contracted the virus after handling the deceased bodies of Ebola virus victims. The World Health Organization reports that the EVD has a mortality rate of up to 90 percent, making any known outbreak of the virus a very serious epidemiological concern. However, it should be noted that the mortality rates currently being recorded in the West Africa outbreak have been lower than 90 percent to date.

Number of Cases: 9,936 (As of October 19, 2014; includes confirmed, probable, and suspected cases)

Death Toll: 4,877 (As of October 19, 2014; includes confirmed, probable, and suspected cases)

Cases in Countries with High Rates of Transmission:

- Liberia: 965 confirmed, 2,106 probable, and 1,594 suspected cases of EVD (total: 4,665); 2,705 deaths (last available information for Liberia is from October 18)
- Sierra Leone: 3,223 confirmed, 37 probable, 446 suspected cases of EVD (total: 3,706); 1,259 deaths
- Guinea: 1,289 confirmed, 193 probable, and 58 suspected cases of EVD (total: 1,540); 904 deaths

Cases in Countries with Low Rates of Transmission:

- Nigeria: 19 confirmed, 1 probable, and 0 suspected cases of EVD (total: 20); 8 deaths
- United States: 3 confirmed, 0 probable, and 0 suspected cases of EVD (total: 3); 1 death
- Senegal: 1 confirmed, 0 probable, and 0 suspected cases of EVD (total: 1); 0 deaths
- Spain: 1 confirmed, 0 probable, and 0 suspected cases of EVD (total: 1); 0 deaths

4 Challenges and Response

Officials attempting to contain the current outbreak face a number of logistical and cultural challenges. Among these challenges is convincing individuals in the affected countries that the Ebola virus is real and deadly. Liberia in particular is struggling to win an information campaign in which some citizens do not believe that the Ebola virus exists, because they either do not know any victims personally or they believe that doctors are misdiagnosing other illnesses common in West Africa. Another challenge facing West African governments is a lack of sufficient health care resources. Containing the virus requires health workers to successfully identify individuals and communities affected by EVD early enough to fully quarantine these areas. The relatively porous nature of the border regions between Guinea, Liberia, and Sierra Leone makes enforcing quarantines more difficult than in major urban centers, where roadblocks and checkpoints can be more easily erected. Additionally, basic health resources such as rubber gloves are in short supply, leaving health workers potentially at risk of becoming infected themselves. Shortages of medical equipment have been exacerbated by bureaucratic troubles in countries like Sierra Leone, which has held up at least one shipment of medical supplies at the port in Freetown for months.

Thus far, the national- and international-level response to the EVD outbreak has been relatively disjointed and ineffective, causing the virus to continue to spread out of the control of national governments. Public health experts agree that improved data collection and strong quarantine implementation are required to gain control over the outbreak. To help curb the spread of the virus, the Liberian government left open only three border crossings connected with neighboring countries and has established screening areas at major points of entry, including the nation's main international airport in Monrovia.



The Liberian Government has been waging an information campaign to convince locals of the reality of Ebola

Additionally, the Liberian president declared a state of emergency and deployed armed military personnel to prevent individuals traveling from affected rural areas to the capital, Monrovia. Likewise, Sierra Leone has deployed military forces to prevent the unauthorized movement of infected persons.

The international community has recently stepped up efforts at helping to contain the current outbreak. On August 8, the United Nations World Health Organization proclaimed that the situation in West Africa to be a "public health emergency of international concern." This proclamation is likely to more rapidly mobilize international assets aimed at effectively battling the epidemic. The United States Centers for Disease Control and Prevention (CDC) mobilized dozens of experts to the region to help local authorities better manage the situation on the ground and provide expertise to health workers in the region. In addition to mobilizing medical experts, the United States announced that as many as 4,000 American troops will be sent to West Africa to help build treatment centers and operate testing laboratories.

4.1 Recommended Best Practices

In addition to national governments and international organizations, some private sector actors have played a role in combatting the spread of Ebola through sound practices in areas where they have significant influence. For example, a major tire and rubberized products company operating in Liberia helped limit the spread of the virus among its thousands of workers and their tens of thousands of dependents. Company executives report that the company quickly mobilized resources after the first case among workers was reported. The company quickly built two isolation units out of cargo containers, trained company janitors on how to properly dispose of Ebola victims, mapped the spread of the disease, and sent educators out to explain the disease to company workers. These efforts appear to have paid off, as there are currently no known new cases of Ebola among the company's employees or their dependents.

The efforts of this business, as well as operations conducted on the national scale, have offered several important lessons on containing the outbreak. Identifying and mapping suppliers and business assets within the affected region is an initial step that should be taken to assess and reduce the potential impact to company operations. Organizations that are able to accurately distinguish where their physical and human resources are in proximity to identified cases of Ebola will be better prepared to take appropriate preventative action. Additionally establishing a system of reporting and information sharing with local and national governments is likely to improve organizational response should Ebola infections spread among company employees.

In addition to strategic-level preparedness, there are tactical-level steps which companies can take in order to closely monitor employee health. Employees should be screened before being granted access to company property to best promote worker health. Multiple daily temperature checks have also been used by some organizations in the region to monitor the daily health of employees, while also allowing for rapid identification of potential Ebola cases. For companies that have employees who have recently traveled, monitoring the duration and location of travel through reporting mechanisms can help companies gauge the risk posed by employees who have recently traveled.

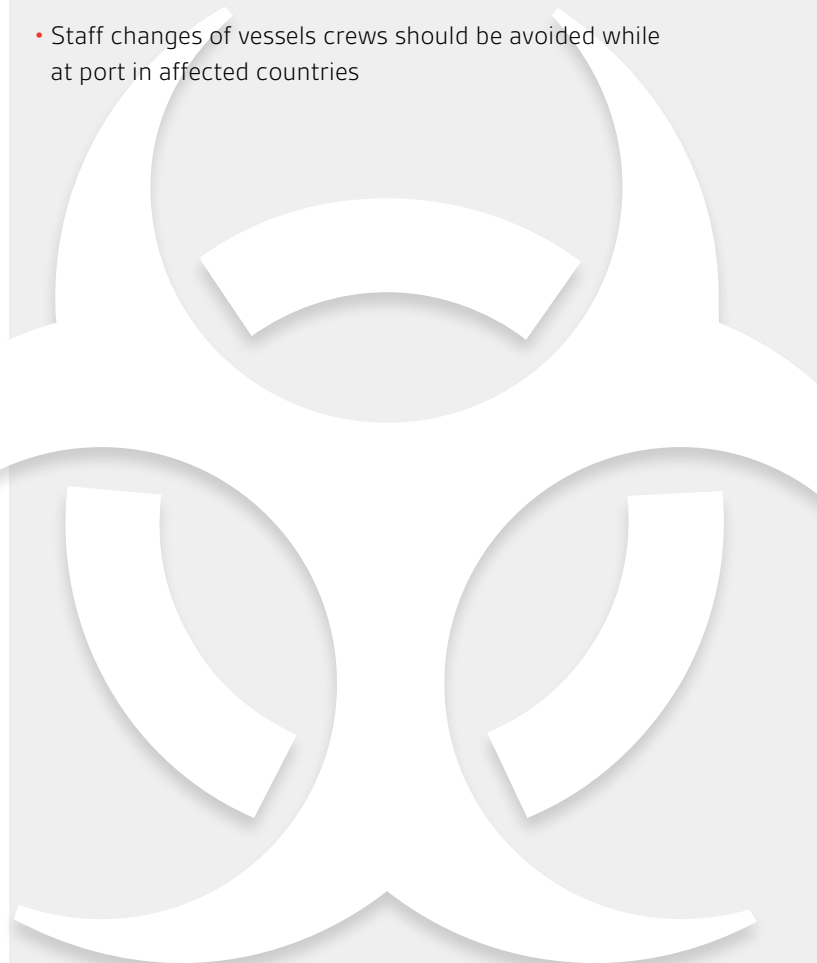
Organizations should also be prepared to act if positive Ebola cases do emerge among a given workforce. Strict quarantine zones for infected individuals should be established, with any hired caretakers fully prepared to protect themselves and others from further infection. Also, establishing a system of identifying first- and second-degree contacts of infected individuals should be in place so that closer monitoring of these individuals can take place so that any infection among company employees can remain as limited as possible.

Cargo transport companies that have vessels calling at ports in affected countries should employ stringent measures aimed at preserving crewmember health during these port calls. In order to reduce the risk of exposure to the Ebola virus, crewmembers should be restricted from leaving the vessel for any reason other than an emergency. By restricting crewmembers' time on shore, companies can greatly reduce the risk of direct contact with Ebola-infected persons and better ensure the integrity of employee health. In a related measure, transport companies should also avoid making vessel staff changes while at port in an affected country, thereby limiting the potential for crew exposure to the virus.

Vigilance is absolutely critical to securing business operations in affected regions. Each and every health issue should be taken seriously and immediately explored. As drug treatments remain partially effective at best and are not prepared for widespread distribution, avoiding potential infections wherever possible should be the focus of efforts. Companies with a significant worker base in an affected nation should consider offering education to workers and their dependents to assist in recognition of the virus. Further, companies with large work forces in affected areas should ensure that their policies toward absences due to illness do not dissuade workers from taking time off to assess their health situation should problems occur. Full containment of the Ebola epidemic is likely to take months, and even more time is needed to confirm that the outbreak has indeed ended. As a result, the situation on the ground is likely to have daily developments which BSI will continue to monitor.

BEST PRACTICES

- Identify and map suppliers and business assets that operate in affected areas
- Identify and understand symptoms associated with EVD
- Identify high-risk areas for transmission
- Establish quarantine protocols should cases emerge
- Ensure there is system in place to track first- and second-degree contacts of infected individuals
- Work with national and local officials, NGOs, and appropriate employees to establish lines of communication and review policies and procedures
- Notify all stakeholders of company policies for education, awareness-building, and protocols
- Limit frequency and duration of company travel outside areas of control within affected nations
- Ensure company sick-leave policy in affected regions discourages sick individuals from working
- Transport companies should restrict crews from leaving vessels while docked at ports in affected countries
- Staff changes of vessels crews should be avoided while at port in affected countries



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