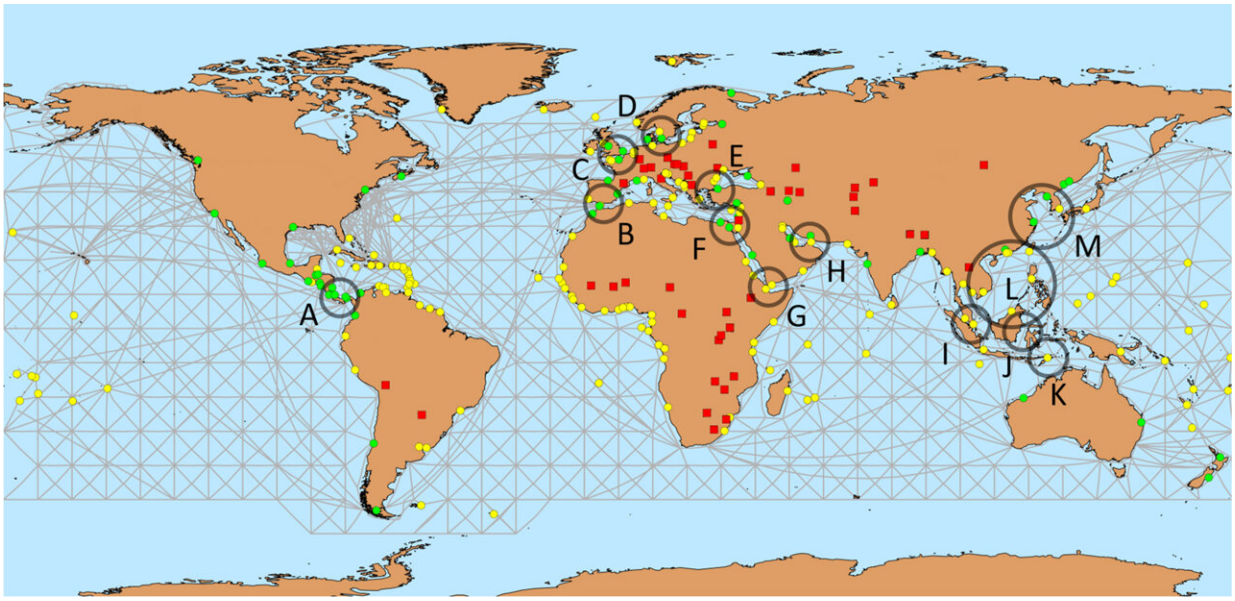
New analysis maps out impacts of marine chokepoint closures

December 22 2022



Major marine chokepoints analyzed in this study: (A) Panama Canal, (B) Gibraltar Strait, (C) English Channel, (D) Danish Straits, (E) Bosporus Strait, (F) Suez Canal, (G) Bab el Mandeb Strait, (H) Strait of Hormuz, (I) Malacca Strait, (J) Lombok-Makassar Strait, (K) Ombai Strait, (L) South China Sea, and (M) East China Sea. Light gray lines are ORNL (2000) international shipping lanes dataset used to calculate shortest routes between principal ports for countries with direct access to the ocean or a sea. Yellow dots mark the locations of the principal port used for countries with one coastline, green dots the principal ports for countries with multiple coastlines, and red squares the capitals or most populous cities in landlocked countries. Credit: *Communications in Transportation Research* (2022). DOI: 10.1016/j.commtr.2022.100083

When the mega container ship Ever Given ran aground and blocked the Suez Canal for six days in 2021, it caused disruptions in international trade for weeks and in global supply chains for months afterward.

The far-reaching impacts drove home how important the Suez Canal and other marine chokepoints, or shipping straits, are to global economic security and how blindsided and ill-prepared for a closure businesses and governments can be.

A new analysis by a Duke University researcher should help.

"This study provides a forward look at the impacts that could result if any of the 11 busiest marine chokepoints was shut down because of geopolitical instability, piracy, marine accidents or other causes," said Lincoln F. Pratson, Gendell Family Professor of Energy and Environment at Duke's Nicholas School of the Environment.

Pratson published his study on Dec. 21 in the journal *Communications in Transportation Research.*

Pratson used GIS data of global marine shipping lanes along with international trade data from 2019 to simulate closure scenarios in the Panama Canal, the Strait of Gibraltar, the English Channel, the Danish Straits, the Bosporus Strait, the Suez Canal, the Bab el Mandeb Strait between Yemen and East Africa, the Strait of Hormuz, the Malacca Strait between Malaysia and Indonesia, the South China Sea, and the East China Sea.

The simulations allowed him to estimate not only the types and amounts of trade that would be disrupted by each chokepoint's closure, but also how the closure could lead to the redirection of trade flows globally.

"When international trade through one of these chokepoints is impeded,

transiting ship traffic gets backed up and subsequent shipping often gets redirected along longer routes to avoid the blockage. This leads to increased shipping times and costs," Pratson said. "Ports that initially experienced lulls in cargo handling because of the closure become backlogged as the delayed cargoes arrive along with ensuing on-time shipments."

The economic impacts of these changes can reverberate for months as international supply chains for everything from electronics, vehicles, and pharmaceuticals to crude oil and food are disrupted, and just-in-time delivery of critical goods is no longer a bankable bet, he said.

"Having a pretty good idea of what to expect if there's a prolonged closure of shipping in one of these 11 chokepoints would help governments, businesses and seaport managers develop strategies for reducing potential shipping and port delays or losses," Pratson said.

Cargo ships move about 80% of all international trade by volume and about 70% of it by value. Much of this trade passes through one or more marine chokepoints en route to its destination. Pratson estimates that value of trade through a number of these chokepoints, such as the Malacca Strait and South China Sea, rivals the GDPs of the world's largest economies.

Furthermore, some chokepoints, such as the Danish Straits, Bosporus Strait, Strait of Hormuz, East China Sea, and South China Sea, provide the only access to maritime trade for a large number of countries.

If these chokepoints are shut down or if traffic through them is reduced for a prolonged period, as has happened in the Bosporus Strait during the war in Ukraine, the disruption can block or severely limit affected countries' ability to import or export goods their economies and world markets alike depend on. This can cause volatility in global supplies and

prices and spur a scramble by nations and businesses on both sides of the chokepoint to secure alternative sources or markets for critical goods.

Other chokepoints, such as the Suez and Panama canals, provide shortcuts between ocean basins that significantly reduce shipping costs and times.

"The closure scenarios suggest that if chokepoints used to move trade between the Atlantic and Indian oceans are closed for an extended period of time, more shipping may be redirected towards the Panama Canal than it can handle, which would end up causing a second source of shipping congestion, cargo delays, further rerouting." Pratson said.

"Given that the operation costs of container ships have been running around $2 million a day, having an idea of how closure of a chokepoint could affect maritime trade globally should be useful information to have in advance," he said.

More information: Lincoln F. Pratson, Assessing impacts to maritime shipping from marine chokepoint closures, *Communications in Transportation Research* (2022). DOI: 10.1016/j.commtr.2022.100083

Provided by Duke University