

THE WUHAN CORONAVIRUS: IMPACT ON SUPPLY CHAIN OPERATIONS AMID THE LUNAR NEW YEAR

January 29, 2020

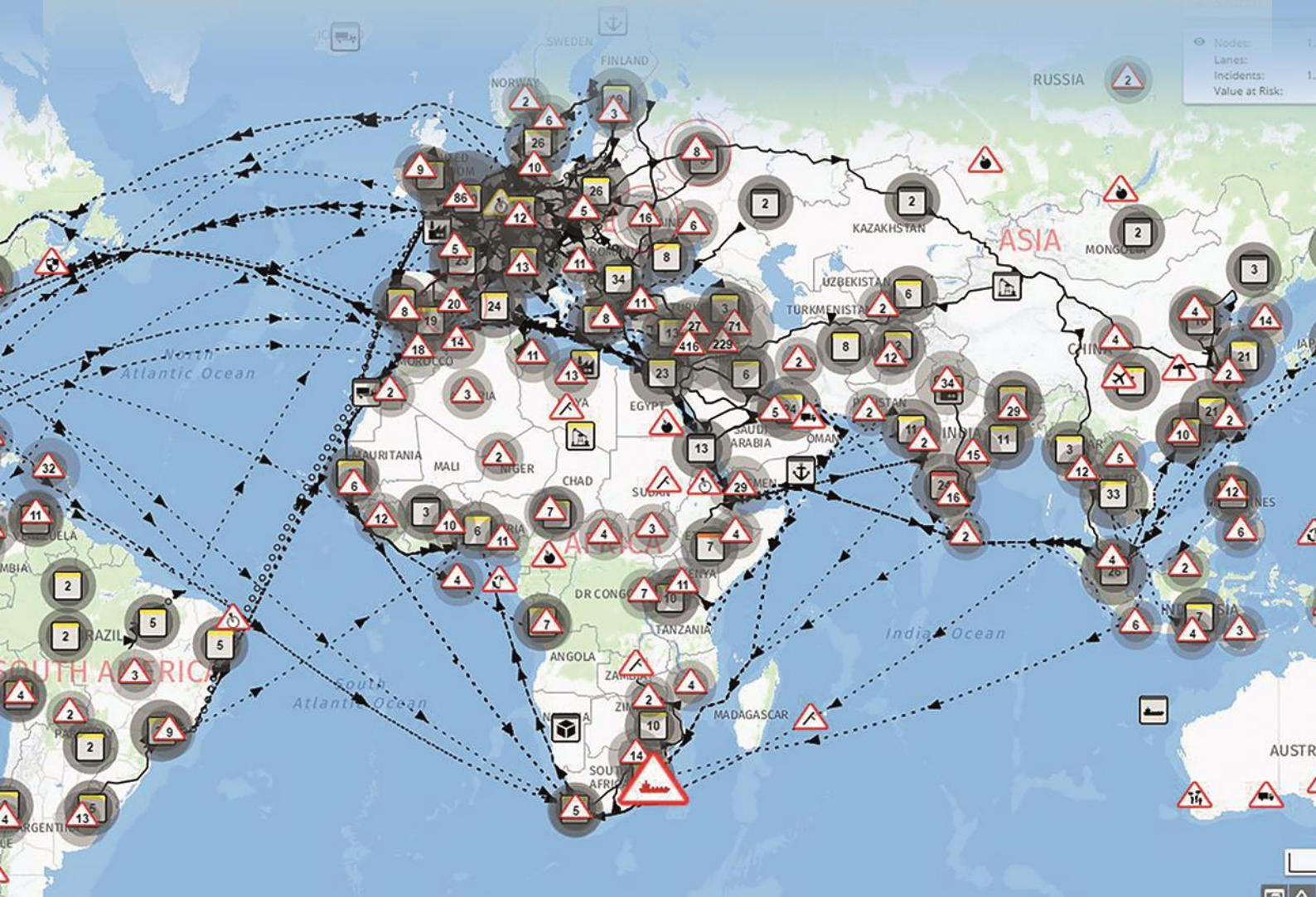
Resilience360 Special Report

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EXECUTIVE SUMMARY

- Since January 23, a deadly novel coronavirus outbreak in Wuhan, Hubei Province – a major industrial and transport hub in central China - has triggered full or partial lockdowns in 13 Chinese cities that have severely restricted key land, air, and maritime transport routes from across the country.
- Severe disruptions to inbound and outbound air cargo shipments, trucking and rail cargo services, as well as heavy port congestion for vessels along the Yangtze River near Wuhan will likely persist as the coronavirus crisis unfolds. The regional lockdown has already severely impeded logistics operations that rely on access to highways to carry goods into and out of the region, while severe delays should also be expected on inbound and outbound air cargo shipments.
- As supply chain managers race to assess the potential impact of the virus outbreak on their supply chains, they will need to cope with the propagation of new or the extension of existing city lockdowns and the delayed restart of manufacturing activities in the affected areas and beyond.
- Should the lockdowns continue beyond the Lunar New Year holidays – a major Chinese festive period from January 24 to January 30 that has been extended to February 2 – it could have a major impact on supply chain operations and industrial production throughout China across industries such as automotive, pharmaceutical and medical supplies, and high-tech manufacturing for optoelectronics and semiconductors.
- Companies and factories in several major cities and provinces - including Beijing, Zhejiang, Jiangsu, Guangdong and Shanghai – have been ordered to halt their operations until at least February 9 with the exception of medical equipment, pharmaceutical companies, supermarkets, utilities and logistics companies in a bid to quell the coronavirus outbreak.
- Although it may be too early to assess how the Wuhan coronavirus outbreak compares to other global health outbreaks such as SARS, MERS and Ebola, there may be some historical trends that can be drawn in terms of economic and supply chain implications.

ABOUT RESILIENCE360



Resilience360 is an innovative, cloud-based platform that helps companies to visualize, track and protect their business operations. The solution facilitates intuitive supply chain visualization, tracks shipments and ETAs across different transport modes and enables near real-time monitoring of incidents capable of disrupting supply chains. Resilience360 easily integrates with business systems and helps companies keep track of risk in combination with their business performance indicators. It enables companies to better ensure business continuity, building risk profiles based on over 30 risk databases, and identifying critical hotspots using heat-maps to mitigate risks and to turn potential disruptions into a competitive advantage.



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BACKGROUND

Chinese authorities in Wuhan - a major industrial and transport hub in the inland Chinese province of Hubei - imposed a city-wide quarantine and severe transport restrictions on January 23 in response to a deadly novel coronavirus outbreak that has already infected more than 6,000 people globally and claimed the lives of at least 130. In addition to halting public transportation, the notice suspended all flights in and out of the city and barred all non-emergency vehicles from entering or leaving the city.

The Wuhan coronavirus outbreak has subsequently triggered a number of similar emergency measures across the country. As of this writing, a total of 13 cities have since been put under full or partial lockdown through similar transport bans. These cities include: Wuhan, Ezhou, Xiantao, Zhijiang, Qianjiang, Huanggang, Chibi, Jingmen, Xianning, Huangshi, Dangyang, Enshi and Xiaogan. A total of fifteen Chinese municipal and provincial-level jurisdictions, including Beijing, Shanghai and Guangdong, have adopted Level I emergency responses - the highest level of public health responses - which could potentially trigger more city-wide lockdowns.

The virus has already spread globally with most confirmed cases being reported in China, in addition to overseas cases in the U.S., Singapore, South Korea, Hong Kong, Macau, Taiwan, Thailand, France, Australia, Malaysia, Japan, Canada, Vietnam, Pakistan, and Nepal. Thousands of flight cancellations to and from Wuhan have been announced by domestic and international carriers, while port congestion and delays have been reported on the Yangtze River as authorities attempt to control the outbreak.

If the coronavirus lockdowns continue beyond the Lunar New Year holidays – a major Chinese festive period from January 24 to January 30 during which some 400 million residents travel back for family reunions and one that has been extended to February 2 under exceptional circumstances – it could have a major impact on industrial production throughout China. Wuhan, the capital of Hubei and home to 11 million residents, serves as a major transportation and industrial hub in central China and is home to a number of automotive and high-tech manufacturing industries focusing on optoelectronics and semiconductor production.

SUPPLY CHAIN IMPACTS: FURTHER LOCKDOWNS AND DELAYED PRODUCTION RESTARTS

As supply chain managers race to assess the potential impact of the virus outbreak on their supply chains, Resilience360 provides below the top two supply chain risks to watch out for in the coming weeks, namely the potential propagation of new or the extension of existing city lockdowns as well as the delayed restart of manufacturing activities in the affected areas and other key manufacturing and logistics regions.

Multiple lockdowns disrupt shipping to and from the region

Trucking and rail cargo services in Hubei grind to a halt

Since January 23, authorities in Wuhan have put the city under lockdown, barring non-emergency vehicles from entering or leaving the city. These measures have been strictly enforced, with police cars blocking major roads and highways and ensuring that only emergency vehicles with critical medicine supplies are allowed to pass. As of January 28, an additional 13 cities have been put under full or partial lockdown through similar transport bans, mainly in cities close to Wuhan in China's Hubei Province.

The regional lockdown has already severely impeded logistics operations that rely on access to highways to carry goods into and out of Hubei Province as most carriers have the regional office for Hubei located in Wuhan. This has effectively halted pick-up and delivery services for cargo and postal shipments in Hubei until further notice. Other administrative regions have reportedly set up check points on highways within their provinces and at interprovincial borders which have caused long traffic jams. A journey from Shanghai to neighboring provinces will now likely require a 4-5 hour-long wait at one of the few highway checkpoints.

In addition, a weekly train connection to northern France via the Europe-China railway corridor has stopped departing from Wuhan and the departure location has been relocated to another Chinese city.

Severe delays in inbound and outbound cargo likely to persist

Wuhan's main airport has remained closed since January 23, cutting off China's 14th busiest airport from domestic and international destinations (see Appendix 1 for all flight cancellations). The airport has flights to overseas destinations that include New York City, San Francisco, London, Dubai, and Singapore. Severe delays should be expected for inbound and outbound air cargo shipments due to the lockdown. Inbound shipments that already arrived at air cargo warehouses in Wuhan or that remain at transit points, such as Hong Kong or Shanghai, are likely to be held there until the situation improves. Outbound shipments' cut-off date before the Chinese New Year has reportedly been January 23; any shipment that missed this deadline is unlikely to have been lifted out of Wuhan.

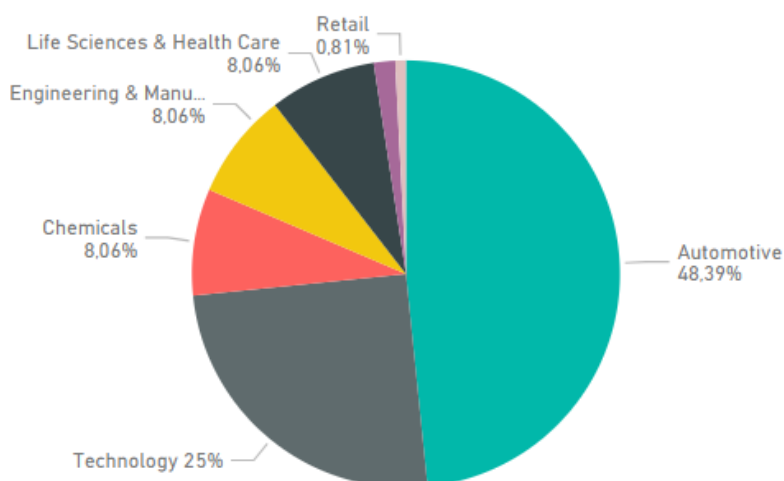
SUPPLY CHAIN IMPACTS: FURTHER LOCKDOWNS AND DELAYED PRODUCTION RESTARTS

Lockdown causes congestion on the Yangtze River

Strategically located on the banks of the Yangtze River, Wuhan hosts China's largest inland river port on the Yangtze that connects Shanghai to the country's hinterland for a third of the costs incurred by road transportation. Since January 23, China has reportedly held back ships, including gas carriers, from calling in Wuhan as authorities ordered terminals to stop their operations in order to slow down the outbreak of the virus. Container services such as the Yokohama, Japan-Wuhan service have reportedly been suspended. Barge operators in Wuhan confirmed that fewer ships were coming into and leaving the port, which has resulted in cargo delays, potential demurrage fees, and congestion up the river as a result of longer berthing times for ships.

Production stoppages may extend beyond the Lunar New Year

In recent years, Wuhan has developed into a hub for high-tech industries such as optoelectronics and semiconductors. It is home to one of China's most advanced chip fabrication plants that makes 3D NAND flash memory used in smartphones and computers. In addition, Wuhan is known as China's "motor city"



Locations in Wuhan and surrounding areas by sector; Source: Resilience360

due to a significant manufacturing presence of domestic and foreign car makers, including Dongfeng Motors, Honda, and PSA Group. The city also hosts hundreds of production facilities of global auto parts suppliers, including Bosch, Valeo, Lear Corp, and Schaeffler.

According to Resilience360's data, almost 50 percent of manufacturing locations in Wuhan and its surrounding cities belong to the automotive sector, while technology and engineering suppliers make up for 25 and 8 percent respectively.

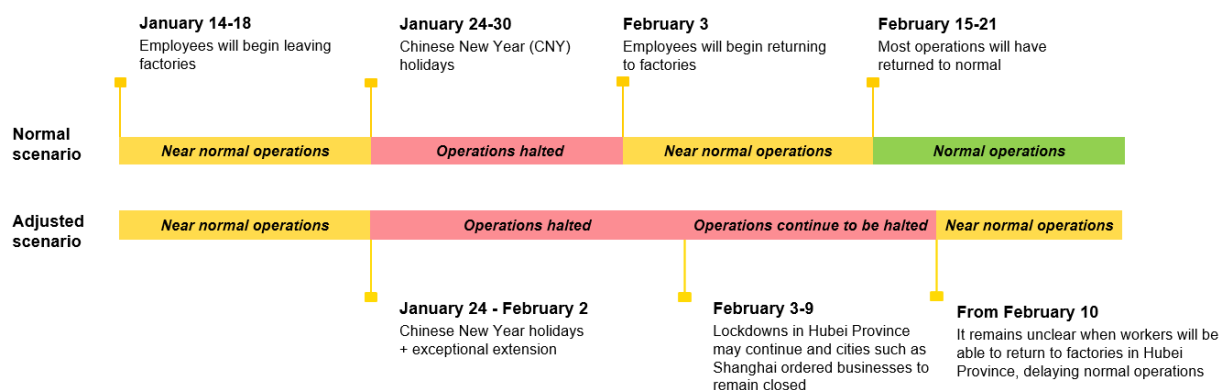
SUPPLY CHAIN IMPACTS: FURTHER LOCKDOWNS AND DELAYED PRODUCTION RESTARTS

Authorities extend holiday period and regional production halts

Should China's authorities struggle to contain the spread of the coronavirus beyond the Lunar New Year period, this could have a major impact on industrial production and the availability of supply coming out of China. In an exceptional move, the Chinese government has already extended the official holiday period by three days from January 30 to February 2 to allow for more time to contain the infection.

Under normal circumstances, post-Lunar New Year manufacturing operations would mostly have returned to normal across China between February 15 and 21. However, this year's timeline is likely to be disrupted due to the extended holiday period as well as the decision by some other provincial governments to further delay the restart of manufacturing activities. Underlining the spillover effects from Hubei to other cities and provinces, authorities in Zhejiang, Jiangsu, Guangdong, Shanghai, and Beijing have ordered factories and businesses to continue to halt operations until at least February 9, with the exception of medical equipment, pharmaceutical companies, supermarkets, utilities, and logistics companies.

Chinese New Year Shutdown Timeline 2020 (Normal vs. Adjusted)



SUPPLY CHAIN IMPACTS: FURTHER LOCKDOWNS AND DELAYED PRODUCTION RESTARTS

Technology, life sciences, and auto sectors to experience disruption

As Wuhan remains locked down, car makers with a significant presence in the city such as Honda reportedly has considered keeping plants closed, with no reopening date set as of January 28. The company reported that its other plant in Guangzhou relied on a car parts maker that sourced from the Wuhan area, thus any prolonged shutdown in Wuhan may also affect its operations elsewhere.

Further east, the city of Suzhou in Jiangsu Province was the first outside of Hubei to announce a delay in the return of millions of migrant workers until February 9. The city hosts large manufacturing facilities of Foxconn, Johnson & Johnson, and Samsung Electronics. According to reports, Cupertino-based Apple Inc. reportedly has about 20 suppliers situated in Suzhou, which might be affected by the ban, including contract manufacturer Pegatron Corp.

The neighboring Zhejiang Province, which extended the production ban until February 9, is home to most of China's production of active ingredients used in the global pharmaceutical industry. In the U.S., roughly 80 percent of these ingredients used by commercial sources to produce finished medicines come from China. Some reports suggested that supplies could be constrained should the Chinese government decide to curb exports of certain materials to stockpile as part of its disaster response efforts.

Other cities and provinces are likely to follow suit with similar bans, potentially delaying production and limiting supplies across several key industrial hubs for weeks after the Lunar New Year, thereby leading to severe consequences for industries relying on just-in-time production in China and beyond. In addition, companies may opt to suspend operations in China on their own. Toyota on January 29 announced it would suspend its China operations in Tianjin and Guangdong Province until at least February 9 citing potential parts supply problems.

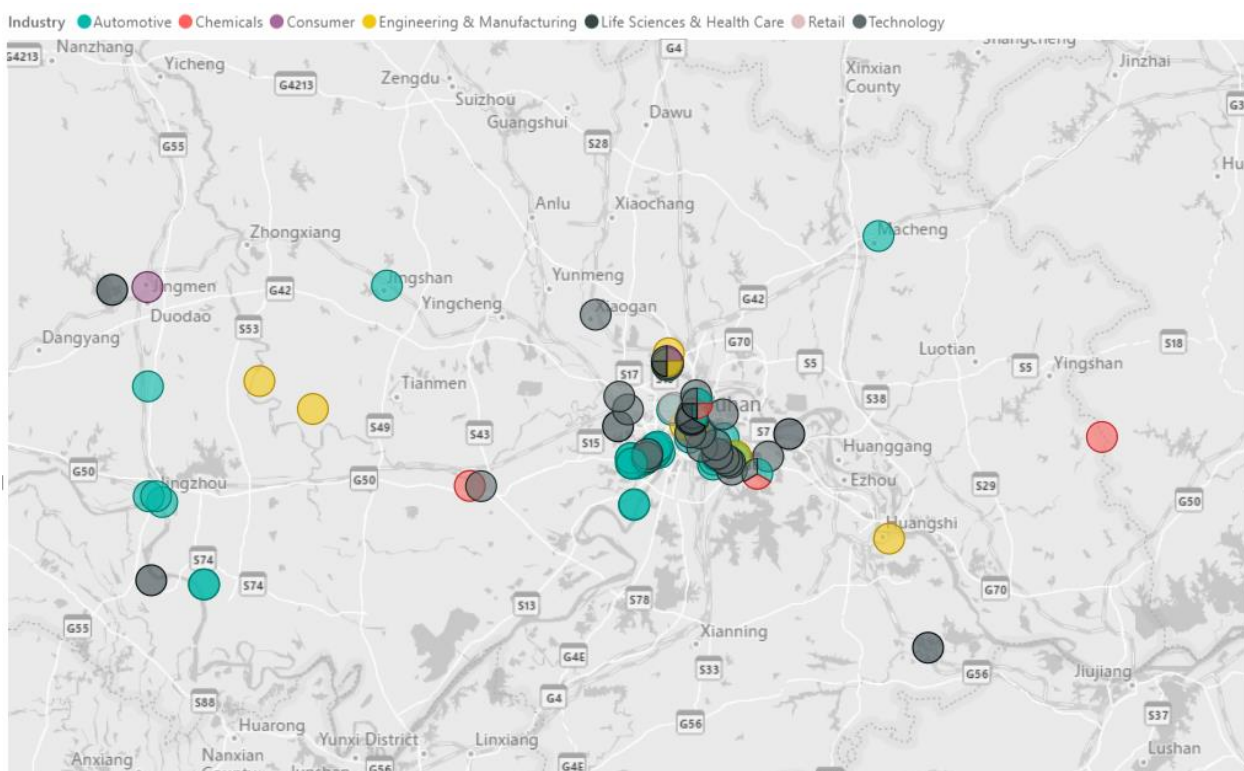
Labor shortages and infected factories among other concerns

In the current context, three key concerns prevail for manufacturers and suppliers in the area: the extent and duration of the lockdowns; the ability of workers to return to their workplace after the holidays; and production bans and the willingness by local authorities to halt business operations over infection concerns.

SUPPLY CHAIN IMPACTS: FURTHER LOCKDOWNS AND DELAYED PRODUCTION RESTARTS

As a result, facilities may operate with lower productivity due to labor shortage for an extended period of time or remain shut altogether should employees become infected. As more infections are recorded outside of China, this may also start to affect operations in Europe, North America and elsewhere. As the first manufacturing company to halt operations overseas, auto parts supplier Webasto announced it would halt operations until February 2 at its main plant in Gauting, Germany following four confirmed cases among its personnel. During the SARS outbreak, authorities in Singapore also quarantined 305 employees of a local Motorola plant at their homes when an assembly-line worker was found to be infected.

As a potential solution, some companies may allow employees to work from home for the time being which is feasible for administrative functions as well as tech companies that operate mainly online or highly-automated industries such as semiconductors, but will be difficult to implement without operational impact on logistics and manufacturing companies that have a lower automation rate.



Manufacturing and supplier locations in Wuhan and surrounding areas; source: Resilience360

COMPARING THE WUHAN CORONAVIRUS WITH OTHER GLOBAL DISEASE OUTBREAKS

Although it may be too early to assess how the Wuhan coronavirus outbreak compares to other global health outbreaks such as SARS, MERS, or Ebola, there may be some historical trends that can be drawn in terms of economic and supply chain implications.

At a macroeconomic level, Wuhan – touted as China's equivalent of Chicago - is expected to only grow now by just 6 percent after originally being forecast to hit a growth rate of up to 7.8 percent in 2020. To provide a direct comparison, China and Hong Kong suffered an estimated 1.1 and 2.6 percent drop in GDP respectively and economic losses of USD 30-100 billion (EUR 27.2-90.8 billion) from the SARS epidemic in 2002-2003.

In terms of infection rates, the Wuhan coronavirus seems to be more contagious but less deadly than SARS. While the fatality rate has not yet been determined with accuracy, it seems to be around 3 percent so far while SARS' and MERS' fatality rate stood at 9.6 percent and 35 percent respectively.

However, in terms of supply chain disruption, even a single infected person can cause an entire factory to halt production as was the case with Motorola in Singapore in 2003. While ports have traditionally been kept open during previous outbreaks such as the SARS epidemic, disinfection operations and labor shortages may still reduce productivity beyond normal levels for maritime trade.

A complicating factor that distinguishes the Wuhan coronavirus crisis is the overlap with the Chinese New Year holidays which have been extended under exceptional circumstances. While operations generally return to normal 2-3 weeks after the end of the holidays, the timeline is likely to be pushed back this year as authorities work to quell the virus. As a major transport hub in central China, Wuhan accounted for 1.2 percent of national freight traffic by weight in 2018 and a prolonged shutdown of the city and the Hubei Province will likely have the broader effect of disrupting the flow of cargo and people.

RECOMMENDATIONS ON HOW TO PROTECT YOUR SUPPLY CHAIN

The Wuhan coronavirus outbreak comes during one of China's most important annual national celebrations and could have serious implications for supply chain operations should it continue to spread. Resilience360 offers a series of recommendations to help supply chain managers mitigate further disruption to their operations:

Short term

- **Identify key suppliers in areas affected by the lockdowns:** Customers should start to analyze whether any of their critical suppliers, distributors, or warehouses are located within one of the lockdown areas in Hubei Province or in one of the affected areas, such as in Shanghai, Zhejiang, Jiangsu or Guangdong, and may be impacted by an extended production shutdown after the Lunar New Year.
- **Secure alternative sources and increase inventory levels:** Knowing the suppliers most exposed and vulnerable to the current situation can significantly reduce the response time needed to activate mitigation measures and leverage time as a competitive advantage when deciding to secure alternative sources from elsewhere in or outside of China and increase inventory levels. Although countries like Vietnam or Taiwan also celebrate the Lunar New Year, production is not halted entirely or for as long as in mainland China.
- **Educate internal staff and key suppliers:** Organizations should educate their staff as well as their key suppliers about the symptoms of the virus, and enforce precautionary measures such as taking sick leave if symptoms show. Lost productivity from the absence of a number of employees due to sick leave can be significantly less expensive than a possible downtime from closing an entire plant because of sick employees or from disinfecting the site.

RECOMMENDATIONS ON HOW TO PROTECT YOUR SUPPLY CHAIN

Long term

- **Monitor potentially disruptive supply chain risks:** Use real-time supply chain risk monitoring tools to continuously keep abreast of further developments regarding the city lockdowns, government shutdowns of industrial areas as well as potential transportation disruptions and assess its impact on one's own manufacturing and logistics networks.
- **Be mindful of using dual-sourcing strategies for key components:** Reducing the number of suppliers has become a norm to allow for more strategic relationships with a handful of key suppliers. However, given the expanding nature of supply chain risks, firms should consider undertaking a strategic cost-benefit analysis to assess if the added cost of sourcing from different geographical locations and alternative suppliers can be worthwhile to prevent future shutdowns.
- **Draft and test contingency plans for a supplier outage:** Companies should make contingency plans in case a plant is, for instance, quarantined because of the virus. In the long term, it is recommended to set up good business relationships with logistics providers or contract manufacturers that have the capability to transport or manufacture similar products in nearby regions or countries. If necessary, these can be used to get new lines set up in the shortest possible time.

APPENDIX 1: FLIGHT SUSPENSIONS AND CANCELLATIONS DUE TO CORONAVIRUS OUTBREAK (AS OF JANUARY 29, 10:00 UTC).

Jurisdiction	Status
Canada	Air Canada cancels some of its 33 weekly flights to China.
China	China Southern (108 flights), China Eastern (78 flights) and Air China (28 flights) have been canceled. Spring Airlines cancels all flights between Wuhan and Osaka from January 24-28. Shenzhen Airlines cancels all Wuhan-related flights until February 10.
Egypt	Egypt suspended all flights to and from China as of January 27. The duration of the suspension was not specified.
Finland	Finnair cancels Beijing and Nanjing routes from Helsinki until end of March.
Georgia	All direct flights from China to Georgia suspended. All flights from China and Wuhan to Tbilisi International Airport were cancelled until January 27.
Hong Kong	All flights to Wuhan from Hong Kong halted indefinitely. Cathay Pacific will progressively reduce capacity to and from China by 50 percent or more from January 30 to end of March in line with a government directive. Cathay Dragon suspends all flights from and to Wuhan until February 29. Hong Kong Express and Hong Kong Airlines will also be cutting flight capacity to China.
Indonesia	Indonesia temporarily suspends all flights to and from Wuhan operated by Indonesian airline carriers. Lion Air Group suspends all flights to China from February.
Japan	All Nippon Airways (ANA) cancelling flights between Tokyo (Narita) and Wuhan from February 1 to March 1.
Malaysia	AirAsia halts flights from Kota Kinabalu, Bangkok, and Phuket to Wuhan from January 24-28.
Myanmar	China Eastern Airlines suspends flights from Wuhan to Yangon and Mandalay from January 24 to February 29.

Source: Resilience360

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Jurisdiction	Status
Palau	All flights from Hong Kong, Taiwan and China from February 1-29 are suspended.
Russia	Flights to Moscow from Wuhan suspended. The duration of the suspension was not specified.
Singapore	Scoot Airlines suspends all daily flights to Wuhan from January 23-26.
South Korea	T'Way Air halts launch of twice-a-week Incheon-Wuhan flights. Air Seoul temporarily suspends all of its Chinese routes. Jeju Air planning to suspend Bushan and Muan routes to Zhangjiajie.
Taiwan	All direct flights between Taiwan and Wuhan cancelled from January 23. Mandarin Airlines suspends all flights between Taiwan-Wuhan through February 27. Eva Airways warns it may suspend flights to China.
Thailand	Chiang Mai International Airport suspends all flights from Wuhan-Chiang Mai from January 24 to February 24.
United Kingdom	British Airways suspends all direct flights to and from mainland China until March 1, although the date has not been confirmed by company spokespeople.
United States	White House holds off suspending China-U.S. flights but monitoring situation closely. United Airlines suspending some flights between the U.S. and Beijing, Hong Kong and Shanghai from February 1-8.
Vietnam	All flights from and to Wuhan cancelled as of January 24.

Source: Resilience360