



Supply Chain Resilience Strategies for Policymaking during and post COVID-19

A Case Study of the Arab Region



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Economic and Social Commission for Western Asia

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Key messages



The Arab region can seize the opportunities of COVID response and recovery to make progress on supply chains.

Digitalization of supply chains is one of the outcomes of the COVID crises.



Supply chain disruption of the COVID has far reaching implications on the Arab region.





Executive Summary

The COVID-19 pandemic has caused global disruptions and hit suppliers in various industries simultaneously, making it difficult to find alternative supply sources. The pandemic has impacted exports and international trade, and drastically reduced supply availability in global supply chains. It has significantly impacted supply chain performance since key players, including manufacturers, distributors and suppliers, are temporarily unavailable. Like the rest of the world, the Arab region has been strongly affected by the pandemic, exposing it to food shortage, lower food exports by food-producing countries, losses in gross domestic product (GDP), and higher local food prices.

The present study addresses the impact of the pandemic on the Arab region, as follows:

1. What is the impact of the COVID-19 pandemic on the logistics sector and supply chains in the Arab region?
2. What are the applicable supply chain resilience strategies during the pandemic?
3. What are the longer-term implications of the post-pandemic supply chain resilience strategies?

The study answers the above questions in two parts:

- **Part 1: Fact-finding on the impact of the pandemic on supply chains in the Arab region.** This part reviews logistics and supply chain performance in the Arab region during the pandemic;
- **Part 2: Applicable supply chain resilience strategies during and after the pandemic.**

This part examines the supply chain resilience strategies applied by impacted companies and organizations in the Arab region during the pandemic, using survey No. 1. The survey was sent to 100 international companies in 10 Arab countries, namely Egypt, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman, Saudi Arabia, Tunisia and the United Arab Emirates. A total of 96 companies responded, representing the following nine industries: construction, pharmaceutical, health care, food, fast-moving consumer goods, automobile, electronic, carpet and cosmetics. With regard to long-term implications of post-COVID-19 supply chain resilience strategies, survey No. 2 was sent to supply chain managers in eight Arab countries, namely Egypt, Iraq, Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia and United Arab Emirates.

I. Part 1: Fact-finding on the impact of the pandemic on supply chains in the Arab region

The expected impact of the pandemic on demand and supply depends on the stage of the crisis cycle. Total exports from the Arab region are expected to decrease by \$88 billion under the worst-case scenario. In addition, intra-Arab exports could decrease by \$14 billion. Total imports to the Arab region are expected to decrease by \$111 billion owing to the negative impact of the pandemic on consumption and exports. The decrease in non-oil imports is estimated at \$89 billion.

The mechanical and electrical industries account for 51 per cent of the total drop in imports, while the chemical industries account for 17 per cent. Under the worst-case scenario, the decrease in the Arab region's exports is expected to reach \$74 billion, while imports will decrease by \$86 billion.

The region expects a loss of nearly \$20 billion in tax revenue from indirect taxes under the worst-case scenario. The import reduction will affect customs revenue, resulting in a loss of \$5 billion in import tariffs. Other indirect taxes, including value-added tax, could lose around \$15 billion, thus negatively affecting government revenues, especially for oil-rich Arab economies.

Regarding global supply chain networks, China is playing an increasingly important role as both a supply and demand hub in traditional trade and simple global value chain (GVC) networks, although Germany and the United States are still the biggest hubs for complex GVC networks. From a supply chain perspective, China is at the end of many Asian value chains, taking sophisticated components from Japan, the Republic of Korea and Chinese Taipei, and assembling them into final products. Two thirds of all intermediate imports of information and communication technology (ICT) products, coming from other countries in Factory Asia, but with significant contributions from Europe and North America, are used as inputs in Chinese exports. Consequently, redesigning supply chains by moving sources and manufacturing activities out of China should take into consideration supply from Factory Asia.

Understanding the redesign of Arab countries' global supply chains requires identifying supply chain networks. Brazil, India and the United States are the main supply sources for Arab countries. They have recently been recommended to replace China in post-pandemic supply chain strategies for most businesses. As a diversification strategy, India can be an alternative supply source given that it has a GDP per capita similar to China, its population is below 35 years of age, English is an official language, and it has cheap human capital and plentiful resources.

II. Part 2: Supply chain resilience strategies in the Arab region during COVID-19

Companies face logistical complexities and challenges in their supply chain flows, including disruption, customs and regulatory restrictions. Globally, 86 per cent of companies pursue formal supply chain strategies. Around 45 per cent of respondents to survey No. 1 monitor world events only when there were global risks, compared with 55 per cent that conduct periodical global supply chain risk assessments. About 71 per cent of respondents actively work on developing supply chain risk management and have business continuity plans. About 40 per cent always involve selected suppliers and customers in supply chain risk management, 28 per cent do it sometimes, 16 per cent do it when there is a risk, and 16 per cent never do it. About 40 per cent have risk managers or teams who go beyond just buying insurance to work on supply chain risk issues, whereas 31 per cent launch risk management teams when there is a risk to the global supply chain. Around 29 per cent do not have risk managers or dedicated teams. During periods of disruption, about 72 per cent simulate or visualise different supply chain risks and disruptions using advanced technological applications to formulate the right strategies. About 60 per cent regularly review their supplier risk mitigation performance, compared with 33 per cent who do not.

As a supply risk, about 51 per cent of respondents suffer from shortages in supplying materials, equipment or tools. As a demand risk, 39 per cent have shortages in inventory and stock. In terms of international transport, about 54 per cent receive delay notices, with high associated shipping costs. This is due to the extension of lead times and cancellations of many flight and shipping schedules. About 60 per cent of respondents have demand shocks and order fulfilment declines. About 50 per cent have shortages in labour and working hour limitations, particularly in Italy. Only 44 per cent have investment/ownership restrictions owing to COVID-19. About 34 per

cent have information and communication disruptions, and 44 per cent face an increase in products prices. About 39 per cent prefer to have an adequate buffer stock of crucial parts and other inputs at hand. About 49 per cent aim to understand how key suppliers and other stakeholders prepare for an unexpected event.

In response to shortages in inventory and delays in transportation, about 59 per cent added capacity to respond to supply disruption. About 63 per cent increased inventory levels to avoid shortages. Only 28 per cent plan to terminate disrupted suppliers, and 53 per cent refuse to cut their contracted suppliers. About 52 per cent have looked for alternative supply sources, and 33 per cent have refused to find alternative sources. To cut costs in disruption periods, about 56 per cent apply the concept of a single major distribution centre instead of multiple small distribution centres. About 93 per cent apply multiple sourcing strategies to avoid supply chain disruption. About 79 per cent apply centralized purchasing strategies.

III. Long-term supply chain resilience strategies

The Arab region can seize the opportunities of COVID-19 response and recovery to make progress on supply chains.

Responses to survey No. 2 indicate that 69.2 per cent of respondents state that intelligent workflows increase process efficiencies to make supply chains more agile, transparent and responsive for employees and customers. About 75.2 per cent believe that the lack of transactions and inventory visibility continues to be a significant challenge. Solutions with embedded artificial intelligence capabilities provide real-time information and actionable recommendations to reduce disruption. About 84.1 per cent aim to reduce the time, cost and risk associated with qualifying, validating and managing new suppliers through permissioned access to a shared view of information and an audit trail built on block chain.

As a post Covid-19 resilience strategy, companies aim to collaborate to resolve disruptions, drive efficiencies and increase supplier satisfaction for critical order-to-cash and procure-to-pay transactions with global business network and supplier collaboration solutions. Getting customers what they need has never been more challenging, but it is possible to manage complexities and preserve business continuity while leaning towards cost optimization. About 74.2 per cent of respondents have reduced shipping costs by 7-8 per cent using order and inventory management applications.

In response to the COVID-19 pandemic and the United States-China trade war, only 49.3 per cent have begun diversifying their sourcing or manufacturing bases. Due to pandemic, about 73.7 per cent support employees to work remotely. About 76.9 per cent are sharing responsibility with authorities to address social and environmental challenges.

IV. Policy response

In the Arab region, policymakers in Government and the private sector are advised to consider the following policy recommendations:

- Governments should retain current supply chain sources that are resilient enough to shift their production strategy to pandemic-based requirements;
- Apart from minimising cost and increasing asset utilization, policymakers should transfer from supply chain networks to digital supply networks to develop end-to-end visibility, collaboration, responsiveness, agility, and resilient supply chain and logistics;
- Arab Governments should develop a manufacturing network strategy with alternative sourcing options for raw material, suppliers and logistics service providers to mitigate disruptions.

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Abbreviations

AI	Artificial intelligence
ESCWA	Economic and Social Commission for Western Asia
FMCG	Fast-moving consumer goods
GCC	Gulf Cooperation Council
GDP	Gross domestic product

Introduction

The COVID-19 pandemic has caused global disruptions and hit suppliers in various industries simultaneously, making it difficult to find alternative supply sources. The pandemic has impacted exports and international trade, and drastically reduced supply availability in global supply chains. It has significantly impacted supply chain performance since key players, including manufacturers, distributors and suppliers, are temporarily unavailable. Like the rest of the world, the Arab region has been strongly affected by the pandemic, exposing it to food shortage, lower food exports by food-producing countries, losses in gross domestic product (GDP), and higher local food prices.

The risks associated with epidemic outbreaks, such as COVID-19, are characterised by three components: long-term unpredictable disruptions; disruption to supply chains; and disruptions in supply, demand and logistics infrastructure.

Global supply chains have transformed the world, so it is important to understand the

risks associated with them. The Fung Global Institute has identified six main sources of risk affecting supply chains in today's integrated global economy: state (national) factors, natural disruptions, man-made disruptions, innovation, consumer dynamics, and macroeconomics. Each of these sources of risk has consequences for the four sets of actors: corporations that are 'supplied', workers that produce, firms that comprise a part of, and regions that embody.

Like the rest of the world, the Arab region has been significantly affected by the COVID-19 pandemic, exposing it to food shortages, lower food exports by food-producing countries, GDP losses, and higher local food prices. The present study aims to investigate the impact of the virus on the Arab region, and to examine supply chain resilience strategies applied to cope with the impact of pandemics on supply chain performance. It is an empirically-grounded analytics study that investigates potential longer-term implications for supply chain resilience.



1. Study objectives

The following are the main objectives of the present study:

- Analysing the impact of COVID-19 on supply chain performance in the Arab region;
- Investigating supply chain strategies applied by various companies;
- Explaining supply chain resilience requirements to cope with the pandemic;
- Providing recommendations on the performance and efficiency of the logistics and supply chain sector.

To meet these objectives, the present study answers the following questions:

- What is the impact of the COVID-19 pandemic on the logistics sector and supply chains in the Arab region?
- What are the applicable supply chain resilience strategies during the pandemic?
- What are the longer-term implications of the post-pandemic supply chain resilience strategies?



2. Study methodology

The duration of the supply-shock depends on the virus's lethality and is thus highly uncertain (Baldwin and Tomiura, 2020). A multimethod approach is therefore applied to provide wider coverage of the pandemic, to gain insight into how COVID-19 has impacted the global supply chain in the Arab region. The present is divided into two parts, as follows:

- The first part aims to understand the impact of COVID-19 on supply chain performance in the Arab region;
- The second part examines supply chain resilience strategies applied by impacted companies and organizations in the Arab region during and post-COVID-19.
 - During the pandemic: Survey No. 1 was sent to managers in charge of supply chains, procurement and purchasing, warehousing, inventory, transportation, logistics, and distribution functions. Primary data were obtained on the impact of COVID-19 on global supply and the applied strategies taken by companies during the pandemic. The survey was sent to 100 international companies in 10 Arab countries, namely Egypt, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman, Saudi Arabia, Tunisia and the United Arab Emirates. A total of 96 companies responded, representing the following nine industries: construction, pharmaceutical, health care, food, fast-moving consumer goods, automobile, electronic, carpet and cosmetics. The researcher organized a Zoom webinar to present survey responses and analysis, and receive feedback about applied supply chain resilience strategies. A total of 5,904 managers participated in the discussion by sharing the webinar live on Facebook;
 - Post-pandemic: Survey No. 2 investigates supply chain resilience strategies applied by impacted companies and organizations in the Arab region for post-COVID-19. The survey was sent to supply chain managers in eight Arab countries, namely Egypt, Iraq, Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia and the United Arab Emirates.

3.

Part 1: Impact of COVID-19 on supply chain performance and redesigning global value chains



A. COVID-19 consequences on supply chains in the Arab region

Undoubtedly, COVID-19 has negatively impacted all sectors, including logistics and supply chain sectors. Like other regions, Arab countries suffered losses in volume and value terms. Various institutions have set scenarios to understand the impact of the pandemic on the supply chain sector. McKinsey and Company has set three scenarios for the pandemic's impact, namely: rapid and effective control of the virus spread; effective measures but the re-emergence of the virus in some regions; and a widespread failure in public health measures. The Council of Arab Economic Unity has set five scenarios for understanding the impact of COVID-19, including:

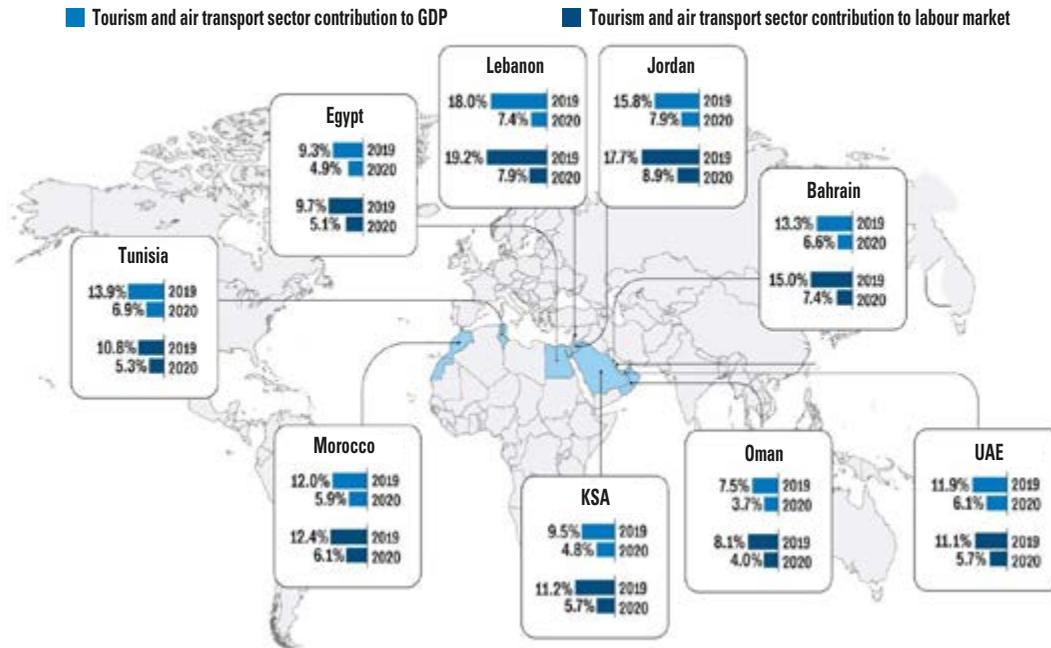
1. V-shape (the danger of the virus faded quickly, taking 6-12 months – less harmful).
2. U-shape (delayed vaccine, taking from 12-18 months – average harmful).
3. L-shape (shutdown will last for long periods, up to 24 months – very harmful and poses security and economic risks).
4. W-shape (repeated virus attacks for a long time, over 24 months – very harmful and poses security and economic risks).
5. Square-root shape (growth rates may stabilize for a long time – very harmful with social, economic and security risks).

The expected impact of the pandemic on demand and supply depends on the stage of the crisis cycle. Total exports from the Arab region are expected to decrease by \$88 billion under the worst-case scenario. In addition, intra-Arab exports could decrease by \$14 billion. Total imports to the Arab region are expected to decrease by \$111 billion owing to the negative impact of the pandemic on consumption and exports. The decrease in non-oil imports is estimated at \$89 billion.

The mechanical and electrical industries account for 51 per cent of the total drop in imports, while the chemical industries account for 17 per cent. Under the worst-case scenario, the decrease in the Arab region's exports is expected to reach \$74 billion, while imports will decrease by \$86 billion. Lower global growth will lead to a potential reduction of at least \$35 billion in imports.

In addition, the mechanical and electrical industries and other products account for 51 per cent of the total drop in imports, while the chemical industries account for 17 per cent of the total drop in imports, the second most affected industries in the Arab region. Under the worsening scenario, the decrease in the Arab region's exports to the rest of the world is expected to reach \$74 billion, while imports will decrease by \$86 billion.

Figure 1. Effects of COVID-19 on tourism and air transport in the Arab region



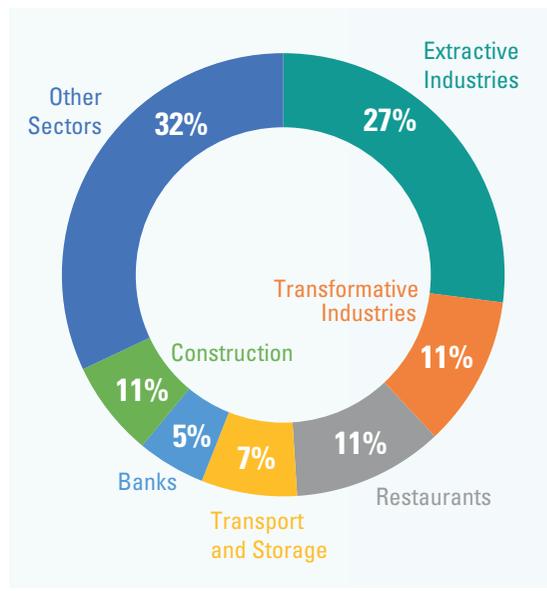
Source: Arab Tourism Organization, 2020.

The region expects a loss of nearly \$20 billion in tax revenue from indirect taxes under the worst-case scenario. The import reduction will affect customs revenue, resulting in a loss of \$5 billion in import tariffs. Other indirect taxes, including value-added tax, could lose around \$15 billion, thus negatively affecting government revenues.

For the tourism sector and associated logistics activities, the contribution of tourism and travel to the Arab region’s GDP is expected to decline by 51.22 per cent in 2020, as shown in figure 1. The sector’s losses may reach \$101 billion in 2020, with a decrease in investment of \$4 billion and in the number of tourists by 40 per cent compared with 2019. The contribution of the aviation sector to Arab GDP decreased by \$65 billion.

Figure 2 shows sectors most affected by lockdown measures in the Arab region, which contribute about 68 per cent of GDP. The most affected sector is the extractive industries by 27 per cent, while the transport and storage functions are affected by 7 per cent.

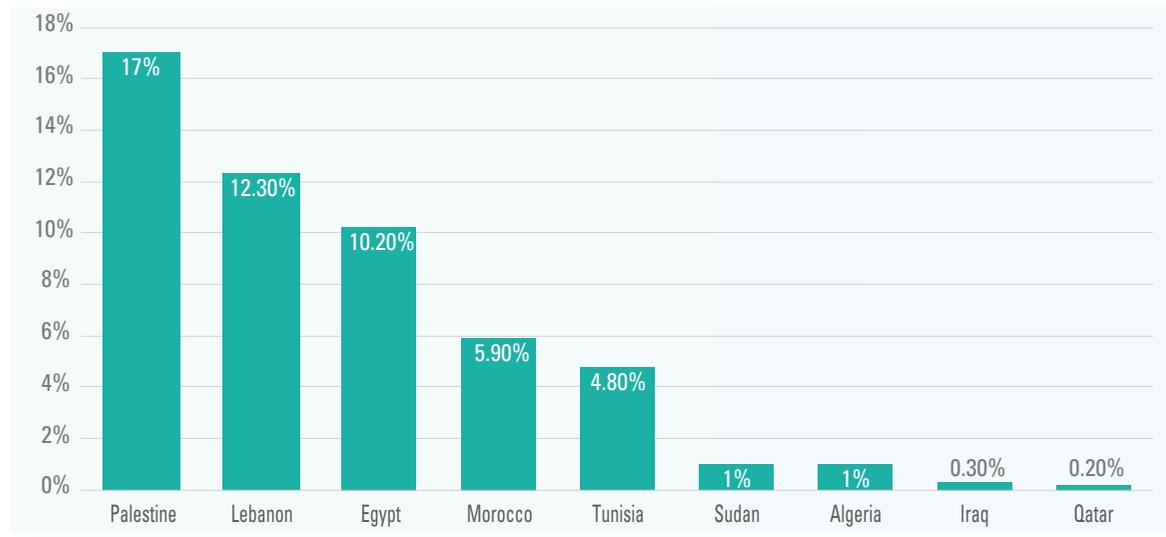
Figure 2. Sectors affected by lockdown measures



Source: Arab Monetary Fund, 2020.

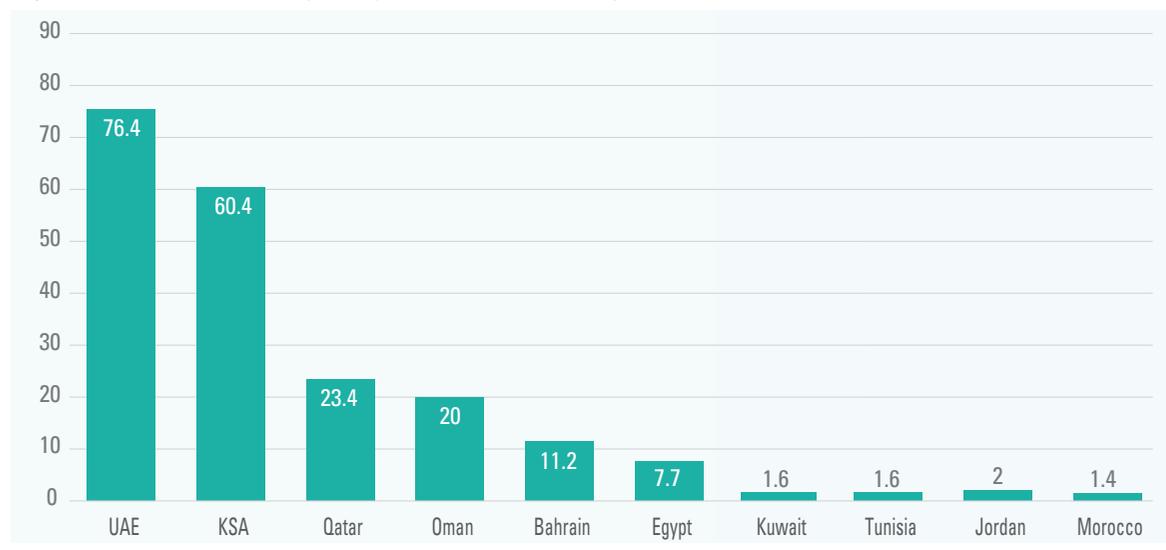
The oil sector has witnessed a decline in demand, with the region responsible for 50 per cent of the decline in world demand.

Figure 3. Decrease in remittances from workers abroad and capital flows in Arab countries as a result of the pandemic



Source: Arab Monetary Fund, 2020.

Figure 4. Financial stimulus packages and measures adopted in Arab countries (billions of USD)



Source: Arab Monetary Fund, 2020.

The pandemic is expected to cause significant continuous decreases in remittances from workers abroad, direct foreign investment, and outflows of foreign funds. Global remittances are projected to decline sharply by about 20 per cent in 2020 owing to the economic crisis induced by the pandemic and lockdown measures. Remittance flows are expected to fall across all World Bank Group regions, most notably in Europe and Central Asia (27.5 per cent), followed by sub-

Saharan Africa (23.1 per cent), South Asia (22.1 per cent), the Middle East and North Africa (19.6 per cent), Latin America and the Caribbean (19.3 per cent), and East Asia and the Pacific (13 per cent).

Arab Governments have provided about \$206 billion in financial stimulus packages, about 8 per cent of GDP. Arab countries providing the most subsidization are the United Arab Emirates, Saudi Arabia, Qatar and Oman, as shown in figure 4.

Example of food supply chain disruption during the pandemic

COVID-19 has disrupted food supply chains worldwide, and raised concerns about food security. Globally, there is sufficient availability of cereals for export to meet global demand, at 2,721 million tons in April 2020 (FAO, 2020). The estimate for global wheat production stands at 763 million tons, and the global rice production output is expected at 512 million tons. In the Arab region, food supply chains are facing localized disruptions and logistical difficulties. However, the Arab region is expected to remain well supplied and balanced.

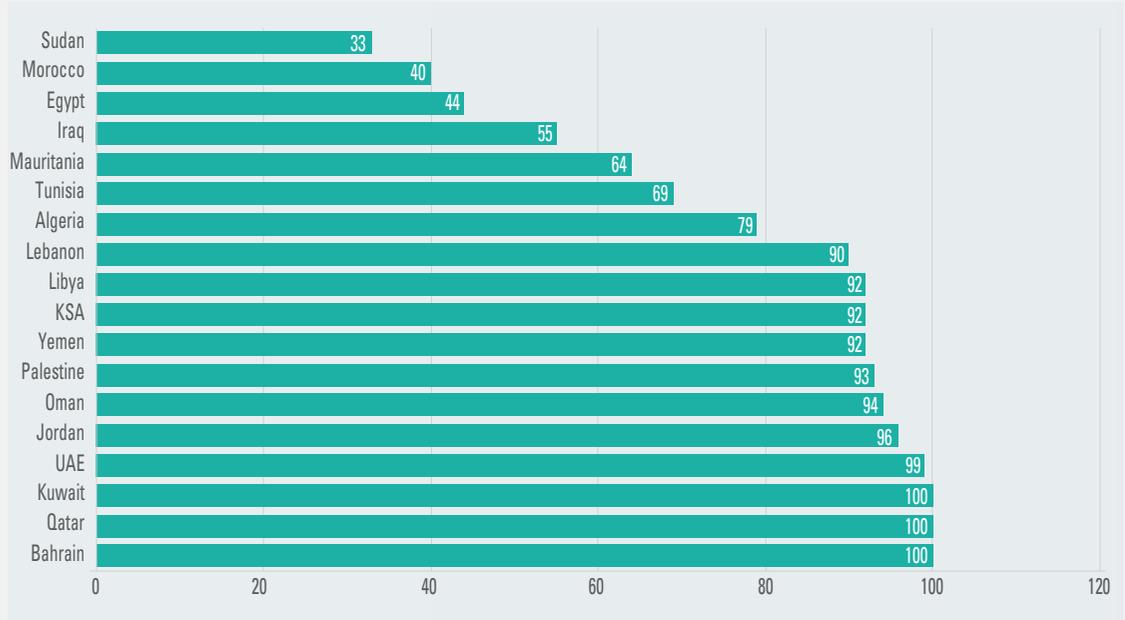
World cereal production, utilization and stocks, as of April 2020



Source: FAO, 2020.

Imposed restrictions on exports and hoarding by importing countries can affect global food availability and prices. It is therefore important to ensure that food supply chains continue to flow smoothly. The Arab region has satisfactory cereal stocks in most countries, despite countries being highly dependent on cereal imports. Bahrain, Kuwait and Qatar import 100 per cent of their cereal, while eight other Arab countries import above 90 per cent. Agricultural countries import less cereal because local production is sufficient, such as Egypt, Morocco and the Sudan.

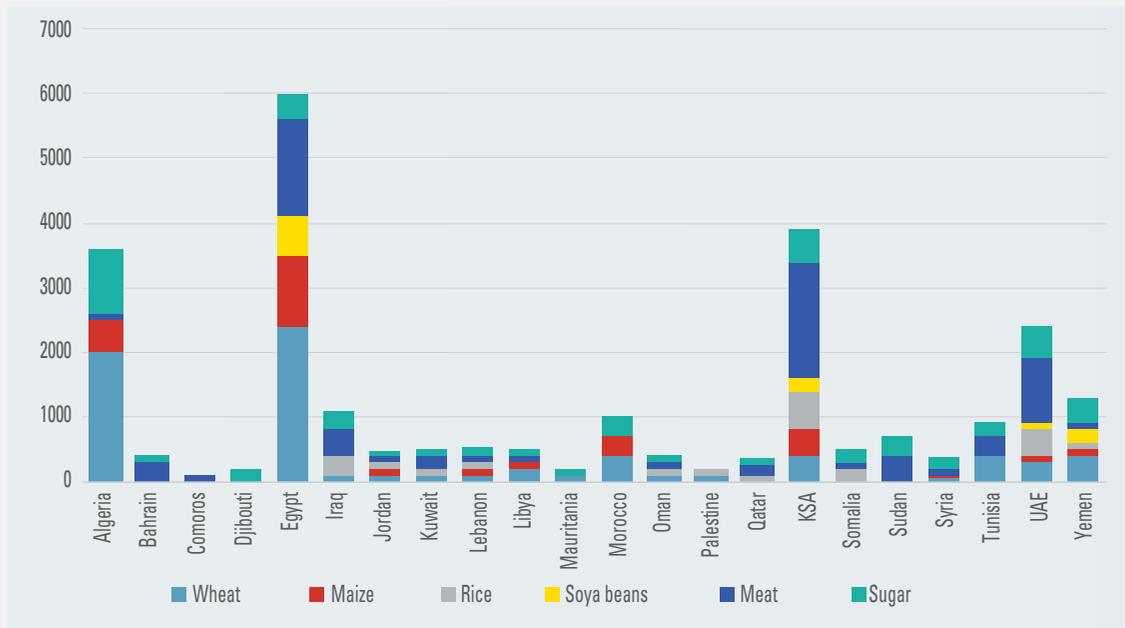
Cereal import dependency ratios of selected Arab countries



Source: FAO, 2020.

However, most Arab countries need to import more cereal for stock purpose, or to import other needs for their food markets. The countries with the highest imports are Egypt, Saudi Arabia and the United Arab Emirates.

Food import in the Arab countries



Source: FAO, 2020.

Cereal supply chain disruptions

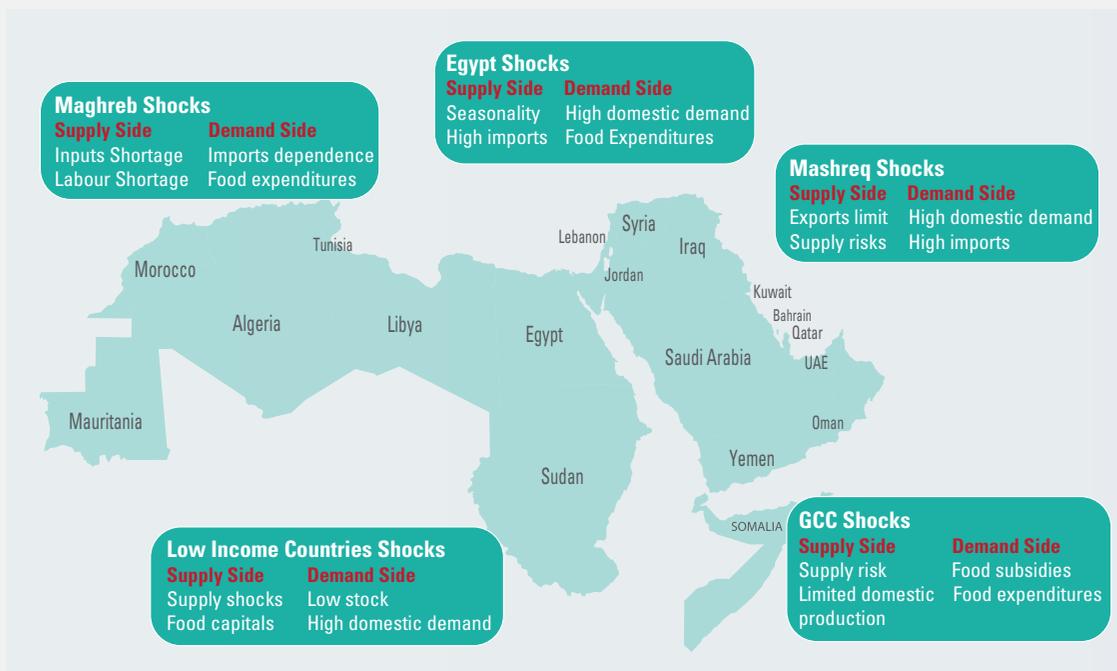
The pandemic has affected food supply in some Arab countries. Production in Morocco has been the most affected, with expected wheat production to be reduced to 50 per cent of the country's average. In Iraq and the Syrian Arab Republic, agricultural output is affected by conflict and a lack of input availability. In Egypt, the world's largest importer of wheat, supplies from the new harvest face challenges in coming on stream in May/June 2020. Hence, some Arab countries decided to raise their stock of wheat. For example, Egypt has decided to raise stocks from six months to one year.

Along the supply chain, other challenges have arisen, such as stock management and inventory control. In Egypt, the Government decided to build reserves of major strategic commodities, including imported and local wheat (8 months), sugar (11 months), edible oil (6.5 months), white rice (4.2 months), frozen poultry (11.9 months), and frozen meat (6.2 months). In GCC countries, a variety of instruments ensure food availability and reduce the risks associated with international markets in times of crisis. They always hold large food reserves, which in some cases reach 12 months of public wheat stocks. Jordan holds a combination of grain stocks and grain on ships that will meet needs for at least 10 months.

Regarding suppliers, some Arab countries ensure availability (for supply risk) and diversification of food import contracts (for price risk). For example, wheat supply for Egypt is sourced from countries including the Russian Federation, Ukraine, Romania, Poland, France, the United States of America and Argentina. However, there are three Arab countries among the 10 top crisis countries and are particularly at risk, namely the Sudan, the Syrian Arab Republic and Yemen.

The COVID-19 pandemic has imposed hazards in conflict-affected countries, where food production systems have been disrupted and where weak institutions exist. Disruption of local value chains and restricted access to humanitarian aid and essential food production supplies and services are expected to further limit access to food in some Arab countries.

Supply and demand shocks related to COVID-19 in the Arab region



Source: FAO, 2020.

B. Global supply chain redesigns for Arab countries

For years, China has been the go-to destination for low-cost and high-quality manufacturing. It has been a key source of supply for high-tech, industrial, automotive, retail, pharmaceutical and other industries. As the pandemic spread, 33 per cent of world businesses have moved some sourcing and manufacturing activities out of China, or plan to do so in the next two to three years, to Africa, South-East Asia, Latin America, and Eastern Europe. This will lead to redesigns in global value chains (GVC) and supply chains for Arab countries. The supply chain redesign will be subject to a set of related variables, as follows:

- Transport services;
- Transport infrastructure;
- Transport costs;
- Transport availability;
- Quality of Transport;
- Transport connectivity;
- Logistics efficiency;
- Logistics performance;
- Trade facilitation.

Regarding global supply chain networks, China is playing an increasingly important role as both a supply and demand hub in traditional trade and simple global value chain (GVC) networks, although Germany and the United States are still the biggest hubs for complex GVC networks. From a supply chain perspective, China is at the end of many Asian value chains, taking sophisticated components from Japan, the Republic of Korea and Chinese Taipei, and assembling them into final products. Two thirds of all intermediate imports of information and communication technology (ICT) products, coming from other countries in Factory Asia, but with significant contributions from Europe and North America, are used as inputs in Chinese exports. Consequently, redesigning supply chains by moving sources and manufacturing activities out of China should take into consideration supply from Factory Asia.

Understanding the redesign of global supply chains of Arab countries requires identifying the supply chain networks for selected countries. The table reviews the global supply chain networks for 10 selected Arab countries with their top five partners regarding both imports and exports.

Regarding the import supply chain, table 1 provides the following findings:

- The highest supply chain networks for Arab imports connect Arab countries with Brazil in Latin America, the United States in North America, and India in Asia. These countries have been recommended to replace China in post-pandemic resilience supply chain strategies for most businesses. As a diversification strategy, India can be an alternative supply source given that it has a GDP per capita similar to China, its population is below 35 years of age, English is an official language, and it has cheap human capital and plentiful resources;
- Since Arab imports depend on Brazil, China and India, Arab countries have greater opportunities to find alternative/backup sources of supply than other regions;
- Potential supply sources are already partners with some Arab countries, such as Argentina and South Africa;
- Inter-regional trade can easily be developed as a post-pandemic strategy, where Bahrain, Egypt, Saudi Arabia and the United Arab Emirates can develop mutual supply chain networks with other Arab countries.

Regarding the exports supply chain, table 1 provides the following findings:

- India is the highest supply chain connected country with most Arab countries. This emphasizes the validity of replacing China with India as a future resilience strategy;
- China and the United States import the most from the Arab region. They will therefore have to redesign their supply chain networks to find alternative supply sources than the Arab region, but this will affect the Arab region in terms of revenues from exports;
- European countries, such as France, Spain and Italy, are significant importers from the selected Arab countries. Arab countries have to develop their exports with other countries that they already have trade partnerships with, such as Greece, Singapore, Indonesia and Germany.

Table 1. Global supply chains for selected Arab countries

Imports	France	Argentina	Russia	Spain	Brazil	United States	Italy	Ukraine	United Arab Emirates	India	China	Iran	Saudi Arabia	S. Africa	Bahrain	Egypt	Romania	Turkey
	Algeria	■	■		■	■		■										
Egypt			■		■	■		■										
Saudi Arabia					■	■			■	■	■							
United Arab Emirates									■	■	■	■	■					
Oman					■				■	■		■			■			
Morocco			■	■		■	■						■					
Jordan						■			■				■			■	■	
Kuwait						■			■	■	■		■					
Tunisia	■		■	■			■	■										
Iraq					■			■	■	■								■
Total	2	1	3	3	5	5	3	3	5	5	3	2	4	1	1	1	1	1

Exports	France	Spain	Brazil	United States	Italy	Germany	United Arab Emirates	India	China	Japan	Singapore	Indonesia	Greece	S. Korea	United Kingdom
	Algeria	■	■		■	■									
Egypt				■	■		■	■	■					■	
Saudi Arabia				■				■	■	■					
United Arab Emirates								■	■	■	■				
Oman								■	■					■	
Morocco	■	■	■	■				■							
Jordan							■	■				■			
Kuwait								■	■	■				■	
Tunisia	■	■		■	■	■									
Iraq				■				■	■				■	■	
Total	3	3	1	6	3	1	2	8	6	3	1	1	1	4	1

Source: ESCWA's compliance based on UNcomtrade, 2020.

4.

Part 2: Implications of supply chain resilience strategies during and after the pandemic



Supply chain resilience strategies in the Arab region during and after the pandemic

In the global supply chain context, companies face logistical complexities and challenges in their supply chain flows, such as disruption, customs and regulatory restrictions. Direct supply disruptions will hinder production and increase the direct supply shocks, increase the cost of business for manufacturing companies, and make it harder and/or more expensive for firms to acquire the necessary imported industrial inputs from hard-hit geographic locations. On the other hand, demand disruptions will lead to economic recessions, purchase delays by consumers, and delay firm investment (Fernandes, 2020). Risk management must be based on a logical sequence of determining risks, and must assess the risk impact and probability risk of occurrence. (Balambo and Haouari, 2014).

Survey No. 1 aims to understand how firms are adopting new global supply chain strategies and restructuring their supply chains in response to fundamental changes in their environment caused by COVID-19. Respondents highlighted the impact of COVID-19 on the global supply chains and on applied strategies.

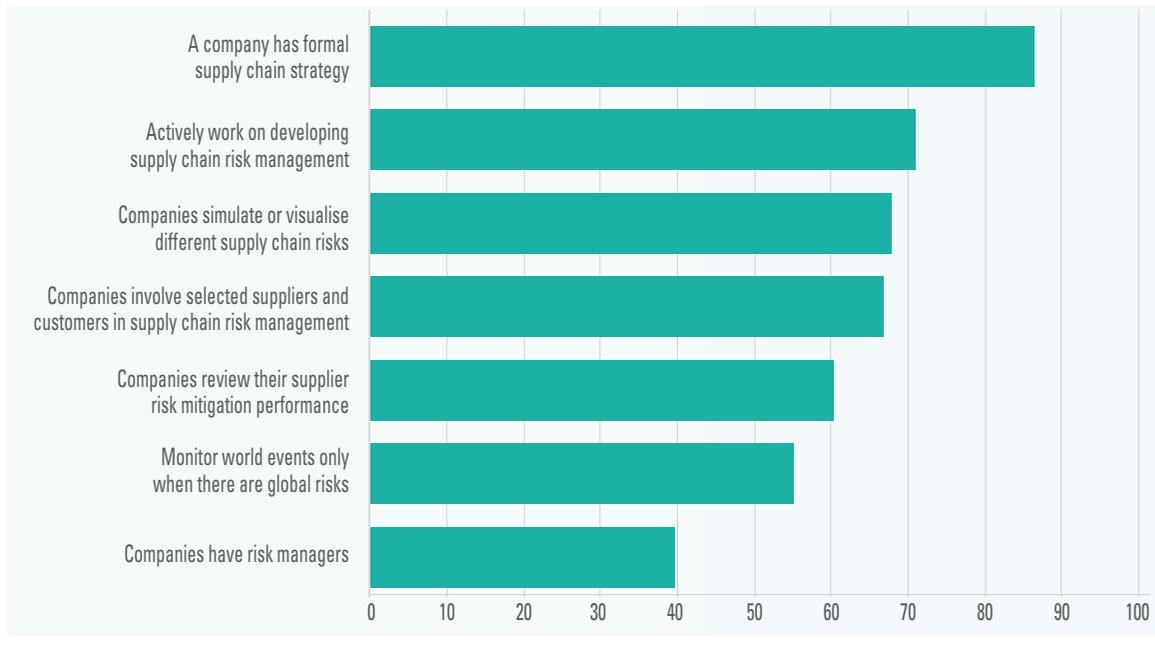
The survey questions are designed according to the four main principles of building resilience in supply chains (de Sousa Jabbour and others,

2020), including engineering (procurement), collaboration (information), agility (visibility), and culture (risk management). In addition, the questions are related to common challenge themes, including demand-supply challenges, technological challenges, and building resilient supply chain.

A. Global supply chain risk management

Figure 5 shows the responses to the question: How can global supply chains remain in a disruption?

The pandemic has given the Arab region renewed focus on building supply chain resilience by shortening and diversifying supply lines, while protecting links to crucial international suppliers and customers. Companies operating in the energy and non-energy sectors have seen revenue plummet and encountered supply chain disruptions linked to the pandemic, which have seriously affected business operations. Deliveries from abroad have become much less certain and more costly owing to suppressed international production and logistics capacity, which together have created new bottlenecks in the supply of raw, intermediate and final products. Companies have started to optimise their operations by minimizing costs, reducing inventories and driving up asset utilization, resulting in a reassessment of strategic priorities. In the Arab region, 86 per cent of companies pursue formal supply chain strategies.

Figure 5. Supply chain readiness in the Arab region during COVID-19

Managing supply chain risk and disruption is designed to help companies in the Arab region understand the implications of COVID-19 on supply chains, and present options for short-term solutions to help alleviate the immediate impact, and present thoughts on how companies can strengthen their supply chain management to guard against future supply chain shock. In the region, about 45 per cent of respondents monitor world events only when there are global risks, compared with 55 per cent that conduct periodical global supply chain risk assessments. This means that most of companies in the region do not have anticipation and mitigation strategies for future risk.

About 71 per cent of respondents actively work on developing supply chain risk management and have business continuity plans. This refers to establishing a sustainable unit within Arab companies to proactively manage financial and operational risks.

About 40 per cent of respondents always involve selected suppliers and customers in supply chain risk management, 28 per cent do it sometimes,

16 per cent do it when there is a risk, and 16 per cent never do it. This refers to the strength of the supply chain risk management in the Arab region, which has a strong influence on cooperation among partners and the performance of the entire production chain. A supply chain designed to minimize risks enables Arab firms to establish a competitive position and provides long-term benefits to stakeholders.

Supply chain risk management refers to the process by which retailers take strategic steps to identify, assess, and mitigate risks within their end-to-end supply chain. About 40 per cent of respondents have risk managers or groups, who go beyond just buying insurance to work on supply chain risk issues, whereas 31 per cent launch risk management teams when there is a global risk that influences the global supply chain. About 9 per cent do not have risk managers or dedicated teams.

In a disruption period, about 72 per cent simulate or visualise different supply chain risks and disruptions using advanced technological applications to formulate the right strategies.

This proactive strategy helps Arab companies avoid supply chain disruption or reduce the future probability of undesirable effects.

About 60 per cent of respondents review their supplier risk mitigation performance, compared with 33 per cent that do not. However, the respondents show various review periods from weekly, monthly, quarterly to yearly review.

B. COVID-19 disrupted supply chain performance

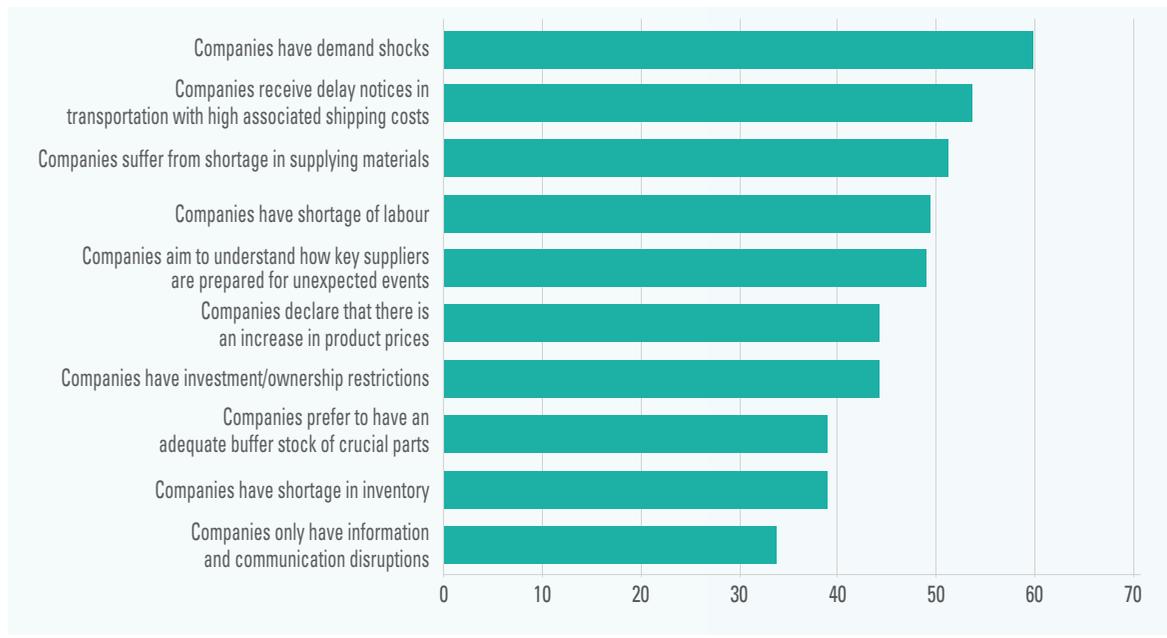
Figure 6 sets out responses to the second question on survey No. 1: How COVID-19 disrupted supply chain performance? (where 1= least impact, and 5 = highest impact):

As a supply risk, about 51 per cent of respondents suffer from shortage in supplying materials, equipment or tools. Shortages have led some companies to look for alternative products to produce, such as sanitizers and face masks, and alternative sources of materials in the local markets. Some Governments are now involved in producing required medical products, such as Egypt and the United Arab Emirates. As a demand risk, 39 per cent of respondents have shortages in

inventory and stock-out occurrence. Thus, most companies and Governments in the Arab region, like other regions, have started to increase their stock levels to avoid longer lead times and any possible shortages of supply. About 39 per cent of respondents prefer to have an adequate buffer stock of crucial parts and other inputs at hand.

However, some companies stocked out as a result of increased customer demand. In terms of international transportation, about 54 per cent of respondents received delay notices in transport, with high associated shipping costs. This is due to extended lead times, the cancelation of many flight and shipping line schedules, slower deliveries owing to closures at Chinese ports, blank sailings that have kept spot freight rates artificially high, disinfection measures, and shortage of labour in seaports and airports. About 50 per cent of respondents have faced shortages of labour and working hour limitations. This may justify why about 44 per cent indicate an increase in product prices, and about 44 per cent have investment/ownership restrictions due to COVID-19. To avoid such disruptions, the survey shows that about 49 per cent of respondents aim to understand how key suppliers and other stakeholders are prepared for an unexpected event.

Figure 6. Supply chains disruption in the Arab region during COVID-19



C. Global supply chain strategies

Figure 7 shows responses for the question: What are the applicable supply chain strategies in the COVID-19 context?

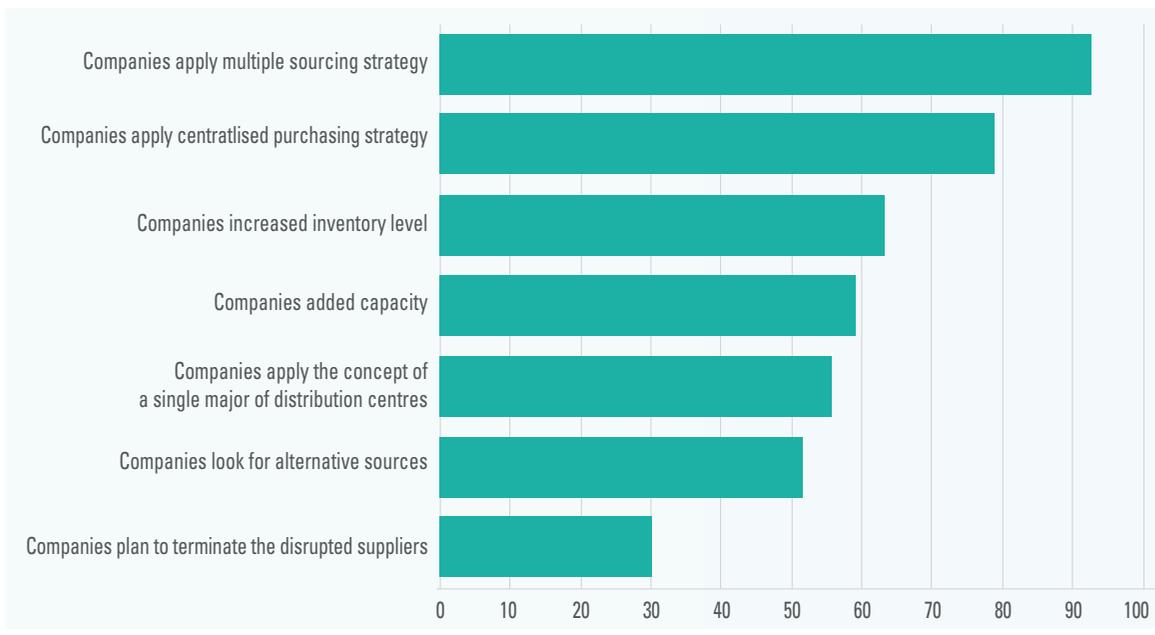
In response to shortages in inventory and delays in transport, about 59 per cent of respondents added capacity to tackle supply disruption. Business leaders must make rapid decisions and take immediate actions to sustain business operations to serve their customers, clients and communities. A set of actions are recommended to avoid such disruptions. Firstly, assessing the costs that lack of inventory and surplus of inventory can cause is crucial to the successful running of businesses. Consequently, about 63 per cent of respondents increased inventory levels to avoid shortages. Secondly, it is vital to create transparency on multitier supply chains by establishing a list of critical components, determining the origin of supply, and identifying alternative sources. However, only 28 per cent plan to terminate disrupted suppliers, whereas about 53 per cent refuse to cut their contracted suppliers. Moreover, about 52 per cent are looking for alternative sources with less specification,

while 33 per cent reject finding alternative sources. Thirdly, it is important to identify and secure logistics capacity, estimating capacity and accelerating, where possible, and being flexible on transportation modes when required. For cutting costs in disruption periods, about 56 per cent of respondents apply the concept of a single major distribution centre instead of multiple small distribution centres. Fourthly, about 93 per cent apply multiple sourcing strategy to avoid supply chain disruption. Lastly, a centralized purchasing strategy is recommended where volume deliveries cut down on delivery charges and staffing costs to move and store the goods. In addition, computerized systems can be used to automate much of the work and integrate purchasing systems with accounting and stock control. The survey shows that about 79 per cent of respondents apply a centralized purchasing strategy.

D. Long-term implications of supply chain resilience strategies

Survey No. 2 was sent to supply chain managers in 137 companies and organizations in eight Arab countries, namely Egypt, Iraq, Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia and the United

Figure 7. Supply chain strategies in the COVID-19 context



Arab Emirates. Different supply chain functions were represented in the responses as follows; planning (19.7 per cent), procurement (22 per cent), inventory (0.8 per cent), warehousing (3.8 per cent), distribution (3 per cent), customer service (9.8 per cent), retailing (1.5 per cent), transportation (7.6 per cent) and logistics (31.8 per cent). The survey results and analyses are shown in figure 8.

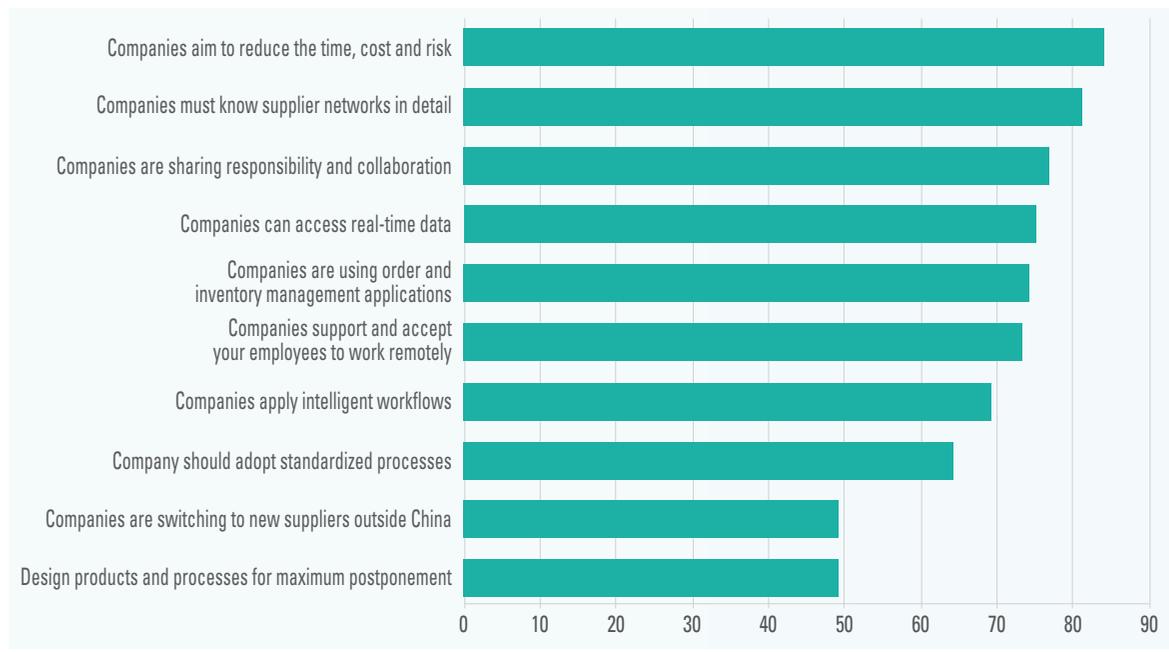
Companies apply intelligent workflows that improve supply chain performance: 69.2 per cent of respondents said that intelligent workflows increased process efficiencies to make supply chains more agile, transparent and responsive for employees and customers. Intelligent workflows improve supply chain performance by strategically integrating proven business-process-transformation methodologies and emerging technologies, including advanced analytics, artificial intelligence (AI) and blockchain. With intelligent workflows and the right process improvements, companies in the Arab region can learn more from supply chain data to proactively mitigate disruption, simplify the way supply chain professionals are recruited and retained, give teams the tools to focus on

higher-value tasks, and deliver more effectively against business goals.

Companies can access real-time data related to the order process, inventory, delivery and potential supply chain disruptions: supply chain visibility is the ability of stakeholders throughout the supply chain to access real-time data related to the order process, inventory, delivery and potential supply chain disruptions. About 75.2 per cent of respondents believe that a lack of transaction and inventory visibility continues to be a significant challenge. Solutions with embedded AI capabilities provide real-time intelligence and actionable recommendations to reduce disruption. Data-driven insight help uncover previously unseen saving opportunities to increase efficiencies and reduce costs. It can also help securely extend shared, near-real-time visibility to trading partners, suppliers and customers, and establish provenance with blockchain.

Companies aim to reduce the time, cost and risk associated with qualifying, validating and managing new suppliers: 84.1 per cent of respondents aim to reduce the time, cost and risk associated with qualifying, validating and

Figure 8. Long-term implications of supply chain strategies



managing new suppliers with permissioned access to a shared view of information and an immutable audit trail built on blockchain. As a post COVID-19 resilience strategy, companies aim to collaborate to resolve disruptions, drive efficiencies and increase supplier satisfaction for critical order-to-cash and procure-to-pay transactions with global business network and supplier collaboration solutions. This can be achieved through embedded AI capabilities, like anomaly detection, cycle time prediction and next-best action recommendations, enabled to respond to supplier issues quickly, even in times of crisis.

Companies are using order and inventory management applications to get real-time visibility into every order across all channels: getting customers what they need has never been more challenging. About 74.2 per cent of respondents have reduced shipping costs by 7-8 per cent using order and inventory management applications that can track orders from inception to delivery, manage processes and data throughout the order lifecycle, and get real-time visibility into every order across all channels.

For a post-COVID-19 strategy, companies are switching to new suppliers outside China: In response to the United States-China trade war, only 49.3 per cent of respondents have begun to diversify their sourcing or manufacturing bases. For some, this has meant switching to new suppliers outside China, or asking existing partners to supply them from elsewhere in Asia or in countries such as Mexico.

As a supply chain leader, companies must know supplier networks in detail and be able to categorize suppliers not just by spending, but also by revenue impact if a disruptive event occurs: In 2011, major natural disasters in Japan and Thailand disrupted supply chains across the world and exposed companies' reliance on single sources of supply. To craft a multi-sourcing strategy, supply chain leaders in the Arab region

must know their supplier networks in detail as a post-COVID 19 strategy, and be able to categorize suppliers not just by spending but also by revenue impact if a disruptive event occurs. Diversification can be achieved by awarding business to additional suppliers or working with an existing single-or-sole source supplier that is able to produce out of several locations.

In response to COVID-19, a company should adopt standardized processes by using interchangeable and generic parts in many products: To achieve built-in flexibility, about 64.4 per cent of respondents recommended taking the following actions: adopt standardized processes; and master the ability to move production among plants by using interchangeable and generic parts in many products, relying on similar and even identical plant designs and processes across the company, and cross-training employees. Interchangeable parts, production facilities, and people allow a company to respond quickly to disruption by reallocating resources where the need is greatest.

Design products and processes for maximum postponement of as many operations and decisions as possible in the supply chain by keeping products in semi-finished form: 49.2 per cent of respondents plan to postpone. It is necessary to design products and processes for maximum postponement of as many operations and decisions as possible in the supply chain. Keeping products in semi-finished form affords flexibility to move products from surplus to deficit areas. It also increases fill rates and improves customer service without increasing inventory carrying costs, because the products can be completed when more accurate information about what the customer wants becomes available.

Due to pandemic, 73.7 per cent of respondents support their employees working remotely. Moreover, 76.9 per cent are sharing responsibility and collaboration among companies and authorities to address social and environmental challenges.

5. Conclusion

The COVID-19 pandemic has led to many disruptions globally. In the Arab region, companies have suffered shortage of materials, long lead times, reduced revenue and service levels, and failure to meet customers' orders. The surveys showed that the majority of impacted companies applied supply chain strategies to simulate or visualise different supply chain risks and disruptions using advanced technological applications and review their supplier risk mitigation performance. However, only half of the surveyed companies have risk managers and launch risk management teams when there is a global risk. A set of other strategies are recommended from the industrial perspective, including changing purchasing strategies, finding alternative suppliers with local sourcing focus, and maintaining a buffer stock to avoid any potential stock out. Such strategies will change the supply chain architecture, at least in the short and medium terms. Accordingly, this will lead to the redesign of the global supply chains. Reviewing the supply chain network for selected Arab countries showed that Brazil, India and the United States are potential backup sources of supply for the Arab region.

Another key conclusion is how some companies fail to simulate or visualise different supply chain risks and disruptions to reach the right strategies. Companies should enhance their staff skills and competencies using technologies, since technology is an indispensable tool in the COVID-19 context. The results of survey No. 1 show the need to apply effective global supply chain resilience strategies to improve decision-making. This includes securing nearshore and local sourcing, the adoption of multiple sources, maintaining buffer inventory, and reducing the number of small distribution centres.

Regarding long-term implications, the results of survey No. 2 indicated that companies apply intelligent workflows to increase process efficiencies so as to make supply chain more agile, transparent and responsive for employees and customers. Intelligent workflows improve supply chain performance by strategically integrating proven business-process-transformation methodologies and emerging technologies, including advanced analytics, AI and block chain.

6. Policy response



Polymakers (government and private sector) in the Arab region are advised to implement the following measures:

Supply chain/ logistics area	Implications
A. Working environment	<ol style="list-style-type: none"> 1. Change work routines, adopt flexible hours and work locations, and implement protective barriers between employees. 2. Improve the virtual capability of the workforce to enhance the digital fitness of the work pattern. Arab organizations should focus on training and coaching staff members to become resilient. 3. Develop economic-ecological-social sustainable and resilient supply chains that consider social wellbeing (job security) and health and safety practices during and post COVID-19.
B. Supply	<ol style="list-style-type: none"> 1. Retain the current supply chain sources that are resilient enough to shift their production strategy to pandemic based requirements. 2. Transform from supply chain networks to digital supply networks that develop end-to-end visibility, collaboration, responsiveness, agility, and resilient supply chain and logistics. 3. Develop a manufacturing network strategy for alternative sourcing options for raw material, suppliers and logistics to mitigate disruptions.
C. Manufacturing	<ol style="list-style-type: none"> 1. Support the production system by providing adequate incentives in future policies. 2. Shift to digital manufacturing (or industry 4.0 based manufacturing), and promote digital technologies such as AI, 3D printing, robots, cyberphysical systems, digital manufacturing, and blockchain for the production of goods. 3. Move towards the circular economy to reduce exposure to so-called 'linear risks', reduce costs and exploit new market and business opportunities.

D. Distribution/ inventory	<ol style="list-style-type: none">1. Equip distribution centres and warehouses with robots and automated guided vehicles for loading and unloading of goods to maintain the social distancing.2. Develop more resilient (proactively and reactively) transport and distribution systems to meet increased production and consumption demand.3. Continue investing heavily in trade-facilitating infrastructure.
E. Retailing	<ol style="list-style-type: none">1. Apply safety and health measures in service operations, as established in hospital, airport and other service settings.2. Implement technological solutions to facilitate online shopping.3. Invest in the development of a 'dark-warehouse' philosophy, defined as full automation of material handling equipment, warehouse execution systems, and automatic identification of inventory and shipments.
F. Customers	<ol style="list-style-type: none">1. Consider demand for essential items only during the pandemic.2. Evaluate policies to reduce food waste and waste management.

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