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STRATEGY & PUBLIC POLICY ADVISORY

GLOBAL FREIGHT RESILIENCE INDEX 2021 ©

RESILIENCE IN THE COVID-19 ERA

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The analysis and drafting of the Global Freight Resilience Index 2021 (hereafter: "Report") was conducted by Whiteshield Partners based on a methodology integrating statistics from international organisations and interviews with the Advisory Board members. The report was developed by Whiteshield Partners team including Tom Flynn, Senior Manager, Assel Tlegenova, Senior Associate, Shalkar Beisembay, Associate and Zhaksylyk Nurmukhanov, Senior Associate, with support of Kai Chan, Senior Manager, and the input of the Whiteshield Partners' freight team including Anthony O'Sullivan, Partner and Director, Yernat Berdigulov, Tair Ichshanov, Alex Crean, Majd Ouiedat and Arthur Pendaries, under the direction of Fadi Farra, Senior Partner and Director, Whiteshield Partners.

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CONTENT

Table 1: 2021 Global Freight Resilience Index results

Rank	Country	Score
1	Singapore	85.5
2	Netherlands	81.1
3	Denmark	80.3
4	Switzerland	78.7
5	Sweden	78.5
6	UK	78.2
7	UAE	77.9
8	New Zealand	77.2
9	USA	77.2
10	Finland	77.2
11	Japan	76.7
12	Germany	76.6
13	Estonia	74.6
14	Austria	73.8
15	Ireland	73.5
16	Norway	72.3
17	Belgium	71.8
18	France	71.4
19	Korea	70.7
20	Spain	70.6
21	Malaysia	70.3
22	Australia	69.1
23	Czechia	68.5
24	Canada	68.2
25	Israel	67.7
26	Lithuania	67.4
27	Qatar	67.4
28	Slovenia	67.2
29	Bahrain	67.1
30	Portugal	66.9
31	Italy	66.9
32	Cyprus	66.3
33	China	66.0
34	Poland	65.7
35	Thailand	65.3
36	Slovakia	64.4
37	Latvia	64.0
51	India	58.7
52	Serbia	58.5
53	South Africa	58.3
54	Mexico	58.2
55	Jordan	58.1
56	Panama	58.0
57	Romania	57.8
58	Indonesia	57.7
59	Costa Rica	57.3
60	Kuwait	56.6
61	Greece	56.2
62	Morocco	55.9
63	Uruguay	55.6
64	Armenia	55.6
65	Botswana	54.5
66	Ukraine	54.3
67	North Macedonia	53.6
68	Peru	53.4
69	Rwanda	53.4
70	Moldova	53.0
71	Colombia	52.7
72	Philippines	52.5
73	Albania	52.1
74	Tunisia	51.9
75	Kenya	51.8
76	Brazil	51.6
77	Egypt	51.2
78	Ghana	51.0
79	Kyrgyzstan	50.7
80	Dominican Republic	50.4
81	Jamaica	50.4
82	Namibia	50.1
83	B&H	49.3
84	Argentina	49.3
85	Trinidad & Tobago	49.1
86	Paraguay	48.9
87	Ecuador	48.8

38	Hungary	63.9
39	Saudi Arabia	62.7
40	Chile	62.5
41	Turkey	62.2
42	Bulgaria	62.0
43	Oman	61.8
44	Mauritius	61.2
45	Azerbaijan	60.9
46	Vietnam	60.1
47	Croatia	59.6
48	Russia	59.4
49	Georgia	59.3
50	Kazakhstan	59.0
88	Mongolia	48.7
89	Côte d'Ivoire	48.6
90	Lebanon	48.3
91	Cambodia	47.9
92	Sri Lanka	47.3
93	Laos	46.6
94	Senegal	46.6
95	Honduras	46.2
96	El Salvador	46.0
97	Mozambique	45.9
98	Guatemala	45.4
99	Pakistan	45.3
100	Uganda	45.0

Source: Whiteshield Partners

EXECUTIVE SUMMARY

COVID-19 BRINGS A NEW FOCUS ON FREIGHT RESILIENCE

Covid-19 tested logistics system in 2020. Global value chains were disrupted due to lockdowns. Many countries were isolated and the global trade volumes have declined significantly, with a 5.3% decline in the world's merchandise trade volume in 2020. This shock accelerated existing logistics trends, such as increasing digitalisation[1], with e-commerce potentially reaching 25% of total retail sales by 2024.[2] Freight players such as port operators and customs agencies have accelerated their adoption of new technologies such as machine learning and AI. Other logistics trends, such as the rise of Southeast Asian trade hubs, increasing importance of free trade agreements, and expanding decarbonisation policies, are expected to continue, with minimal impact from Covid-19.

To respond to trends and prepare for disruptions, policy makers can enhance freight resilience. Freight resilience is the ability of a country's logistics sector to manage and recover from potential shocks. A resilient freight sector: (1) captures the benefits of global trade and (2) withstands global fluctuations in trade volumes during a crisis. The Whiteshield Partners Global Freight Resilience Index 2021 identifies resilience gaps and policy solutions by assessing 131 countries across policy opportunity and freight performance dimensions over 35 indicators.

SINGAPORE IS THE MOST RESILIENT COUNTRY IN TERMS OF FREIGHT AND LOGISTICS

Singapore, the Netherlands and Denmark display the most resilient freight sectors in the world according to the Global Freight Resilience Index 2021. The top three countries are followed by Switzerland, Sweden, UK, UAE, New Zealand, USA and Finland (Table 2).

Over the last five years, the average GFRI score has increased by 7%, supported by an 11% increase in policy opportunity scores, while freight performance has decreased by 3% globally. Low-income countries have shown the strongest growth in freight resilience over the last five years (9%), while the lowest growth in resilience was registered by high income countries (1%).

Table 2. Overview of GFRI 2021 results for top 10 countries

Country	GFRI 2021 Rank	GFRI 2021 score	1. Policy Opportunity pillar rank	Policy Opportunity pillar score	2. Freight Performance pillar rank	Freight Performance pillar score	Trend (2016-2021)
Singapore	1	85.5	1	86.4	1	84.7	0
Netherlands	2	81.1	12	79.2	2	83.0	6
Denmark	3	80.3	3	84.8	8	76.0	4
Switzerland	4	78.7	7	82.4	9	75.2	12
Sweden	5	78.5	5	83.2	10	74.1	-2
UK	6	78.2	10	79.7	4	76.8	-1
UAE	7	77.9	9	79.8	7	76.1	11
New Zealand	8	77.2	6	82.6	12	72.2	-6
USA	9	77.2	2	85.0	19	70.2	-5
Finland	10	77.2	4	84.5	17	70.5	-4

Source: Whiteshield Partners

[1] http://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/

[2] https://www.groupm.com/this-year-next-year-ecommerce-forecast/

SIX KEY INSIGHTS FROM GFRI 2021

- **Advanced economies** with high income levels **are more resilient:** Countries in the upper quartile of the GFRI 2021 are all high-income countries, except for Malaysia (21st) and China (33rd).
- **Countries with strong institutions are better equipped to deal with potential freight challenges:** During the Covid-19 crisis, countries with low scores on Institutional Improvement had higher exports reductions.
- **Smaller country size facilitates freight resilience:** Smaller countries dominate the top 10 of the GFRI possibly due to easier institutional coordination and flexibility to align policy quickly across stakeholders. The USA and UK are the only countries in the top 10 with populations above 20 million.
- **Countries with decentralised governance have increased freight resilience.** The 25% most decentralised countries had an average GFRI score of 61, compared to 48 for less decentralised states – potentially as they better understand local factors and can act quickly and precisely.
- **Technological readiness sub-pillar has been increasing faster than other dimensions:** The average technological readiness score has increased by 27% over the last 5 years, while overall resilience has grown by a moderate 7%, which signals active adoption to digitalisation trend by many countries.
- **High levels of regional differences:** While six of the top 10 countries are in Europe, North America remains the best performing region overall with an average score of 73. Europe lags behind North America due to high intra-regional inequality: 81 positions separate the top-ranked Netherlands and the low-ranked Bosnia and Herzegovina.
- **Countries in the Regional Trade Agreements (RTAs) share similar patterns in freight performance:** RTAs significantly influence the trade policies and logistics flows and consequently, the GFRI scores. Countries in RTAs have similar economic, institutional and technological development levels.

SHIFT IN POLICIES FROM COST-EFFICIENCY TO RESILIENCE

Post-Covid countries need to focus on transitioning from developing cost-efficient supply chains to encouraging resilient logistics. To absorb future shocks, benefit from global trends and increase resilience, freight policy makers and stakeholders can integrate **four main blocks of cross-cutting policies** (Table 3):

Table 3. Four main blocks of cross-cutting policies

Policy area	Policy components	Case example
Strengthening economic environment	Enhancing multimodality Improve logistics infrastructure Develop new skills to attract top talents to the industry	Singapore has developed world-class infrastructure and skills programmes to facilitate trade performance and enhance logistics efficiency
Enhancing institutional improvement	Develop strong and inclusive institutions to facilitate trade and promote cooperation with the private sector Introduce innovative partnerships with private sector to promote the quality of PPPs	South Korea's PPP Act and the PPP Enforcement Decree design regulation and procurement for logistics infrastructure projects to facilitate private sector participation
Focus on emerging	Adopt advanced technologies to increase productivity and efficiency in	Singapore launched the "Intelligent Freight Planning" project to deploy AI

Policy area	Policy components	Case example
technologies in logistics	logistics – for example, IoT and machine learning technologies in freight operations and implementation of AI in freight models	applications in freight to create a freight movement ecosystem where parties use AI to share information and collaborate to enable efficient freight and truck movement
Adopt sustainability measures in logistics	Promote green policies, such as adopting legislation to reduce emissions, and incentivise freight companies to follow "green" policies	Nordic countries are implementing favourable legislation on active reduction of greenhouse gas emissions in the logistics sector

TAILORING POLICY DEPENDING ON RESILIENCE POSITIONING

Beyond developing cross-cutting policies, countries should also develop specific policies based on their level of freight resilience and the urgency to act. The urgency to act is a measure of the magnitude of misalignment between a country's policy opportunity and its freight performance pillars, which shows further potential to enhance freight resilience in the future. Based on these criteria, **four distinct country segments** can be identified, with specific policy focus areas to develop (Table 4).

Table 4. Policy Grouping by Country

Categories	Description	Focus area
Sustain advantage	Leaders of the ranking with balanced GFRI portfolio	Continuous innovation to sustain leadership position by utilising information and new technologies
Unlock performance	Above average performers, but with uneven scores across resilience dimensions	Enhancing domestic market policy environment to sustain activities in trade Evaluate sustainable policy initiatives that encourage traders to support the local industry
Enhance policies	Balanced scores on resilience dimensions but lower scores in overall resilience	Increase investment opportunities through expansionary policies and incentives Benchmark global trade opportunities and increase connectivity and multimodal transportation logistics
Focus efforts	Unbalanced underperformers in both policy and freight dimensions	Evaluate geographic and trading positioning of country and infrastructure requirements Accelerate policy development focused on emerging capabilities

BACKGROUND TO THE GLOBAL FREIGHT RESILIENCE INDEX 2021

Covid-19 has led to questioning of traditional approaches in logistics

2020 was one of the most challenging years in modern history. The economic shock of Covid-19 tested the ability of countries with freight exposure to rebound from the challenge of a collapse in trade brought on by the Covidepression, and it continues to do so.

The freight sector has not been spared the consequences of Covid-19. The global downturn caused a decline in trade flows and numerous supply chain disruptions. As Covid-19 shows, unexpected shocks raise a question to policy makers about how to absorb disruption and mitigate risks of future turmoil. However, policy makers lack a comprehensive framework to assess whether their countries' logistics sector can withstand future shocks and to develop an effective policy response.

Defining and measuring freight resilience

"Resilience is most often defined as the ability of individuals, communities and states and their institutions to absorb and recover from shocks, whilst positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty" – OECD, 2013.[3]

The Global Freight Resilience Index (GFRI) is an annual publication developed by Whiteshield Partners which ranks countries on the resilience of their logistics (Figure 1). Freight resilience is more than just about the size of the freight industry in a country. Rather, freight resilience is the ability of a country's logistics and support institutions, infrastructure and stakeholders to manage and recover from shocks. A resilient freight sector is one that displays two phenomena: (1) It should capture the benefits of global trade. For example, countries with high freight resilience leverage their logistics infrastructure to create and convert global trade opportunities into results by providing advantages in cost, time and service delivery. (2) It should be able to withstand global fluctuations in trade volumes. For example, a resilient country would better maintain or find alternative supply chains during a trade shock.

Freight resilience is determined through policy and performance

The GFRI provides a comprehensive framework and assessment methodology to evaluate freight resilience and identify current and potential gaps. Policy makers can use this insight to target specific areas for support to boost freight resilience, to identify world's best practices to further implement locally, and to ensure their countries' freight sector is well-positioned for the future.

The Index comprises two sub-pillars: policy opportunity and freight performance. It takes into consideration indicators at the country-level (Figure 1):

- The policy opportunity pillar analyses a country's current trajectory and potential for further improving its macro-environmental factors, specifically, institutional, economic, social, and technological factors. Indicators in this pillar evaluate a government's conduciveness to trade by assessing its overall economic resilience.
- The freight performance pillar analyses a country's relative performance in trade, freight, and logistics. Indicators in this pillar evaluate the level of service and the relative success in trade and logistics performance.

The GFRI uses 35 indicators to examine countries across policy and performance dimensions.

The policy pillar is a distinctive feature of the Index and is fundamental for the development of countries' trade. Institutions and policies highly influence freight in response to escalating global

[3] "What does "resilience" mean for donors?", OECD fact sheet, 2013. http://www.oecd.org/dac/May%2010%202013%20FINAL%20resilience%20PDF.pdf

challenges. Most of the research in freight is focused on performance, rather than on the policy perspective, which makes the GFRI a unique gauge of freight resilience.

Figure 1. The Global Freight Resilience Index framework 2021

Source: Whiteshield Partners

SHORT-TERM TRENDS IN FREIGHT

The dual shock of Covid-19 and global economic downturn disrupted supply chains and trade flows

In 2020 the vulnerability of trade was tested by the Covid-19 pandemic. Global value chains were disrupted as the world embarked on the Great Lockdown. Economic activity paused as countries around the world imposed restrictions on mobility and trade as a means to contain the novel coronavirus. In the Great Reset following the Great Lockdown, we are now set to see which countries are best able to bounce back from the hole in their economies left by a collapse in global trade.

Due to lockdowns, many countries were isolated from international trade, which significantly affected the socio-economic indicators of many countries and created certain difficulties for effective operations of their logistics system.

Covid-19 highlighted how relying on a few trading partners can lead to supply chain vulnerabilities, with countries that lack diversified trading partners particularly affected. As an example, the major impact of Covid-19 on Chinese manufacturers led to a domino effect of disruption in the supply chains of major economies. The G7 economies alone rely heavily on China for imports, bringing in goods and services worth nearly $1 trillion (roughly, 2% of their GDP).[4]

Disruption in one component of the value chain can cause significant supply chain delays and lead to goods shortages. This is evident by looking at Apple Inc. who postponed their annual product launch due to delays in their global supply chain—interruptions which originated in China but continued as the virus spread to other nations.[5]

The global trade fall shifted the paradigm in freight and logistics towards resilience

Logistics sectors which themselves are part of the trade ecosystem have been hit hard during the pandemic. According to the World Trade Organisation the volume of world merchandise trade in 2020 fell by 5.3%.

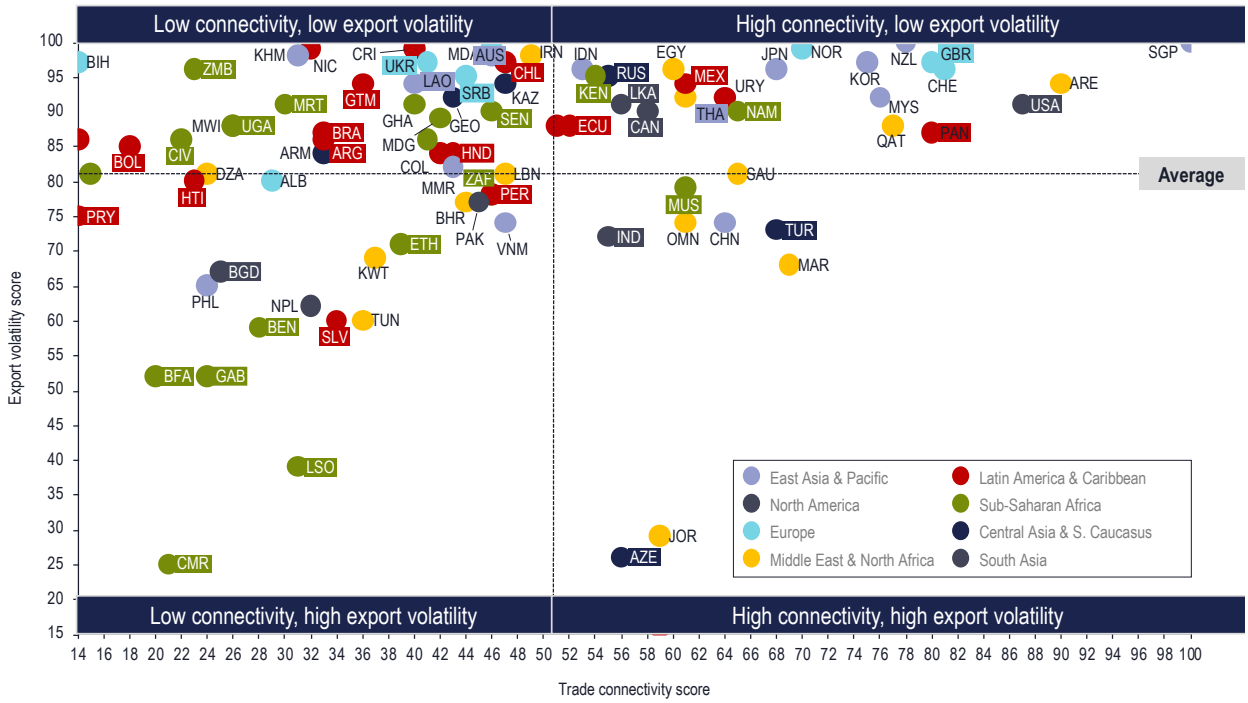
Travel restrictions led to shortages of ocean freight, with a drop of 10.1% in the first months of 2020, and air freight, with a reduction of 19% in March 2020 due to sharp reductions in passenger flights. In contrast, the land freight remained relatively stable globally during the first wave of Covid-19 shock, except in countries with severe lockdowns.[6]

One solution to a major shock is to diversify supply chains, however not all countries were able to quickly do this due to low levels of multimodality and low land freight capacity. Figure 2 shows the relationship between export volatility, an indicator which tracks export performance across the last 4 quarters and logistics connectivity, measured as an average score of air, land and maritime connectivity.

[4] Center of strategic and international studies, 2020 https://www.csis.org/analysis/recovery-international-diversification-supply-chains-impact-covid-19-economics

[5] https://www.industryweek.com/supply-chain/article/21126666/a-covid19-supply-chain-shock-born-in-china-is-going-global

Figure 2. Export volatility during Covid-19 vs logistics connectivity segmented by region



Note: Logistics connectivity is calculated as an average score of airports, maritime and land connectivity scores. Export volatility is based on Q2 2020 UNCTAD estimates. It tracks export performance across the last 4 quarters. A greater score implies lower vulnerability.
Source: Whiteshield Partners, UNCTAD

The resilience of freight sectors in this case matters most, as countries with stronger institutions, logistics infrastructure and diversified trade partners were able to minimise shocks of Covid-19 crisis on trade and the whole economy. In fact, the most resilient countries in the GFRI have higher levels of connectivity, which allowed them to better navigate the Covid-19 storm of supply chain disruptions.

The recovery from the crisis will require rapid responses across all sectors, especially in freight and logistics

The year of 2021 is set to be the year of recovery. According to the World Economic Outlook, April 2021, by the International Monetary Fund (IMF), global growth is projected at 6% in 2021.[7] The freight and logistics sector faces one of its biggest challenges yet with the distribution of the Covid-19 vaccine.

Nonetheless, recovery will depend on compliance with constraining measures, like persistent social distancing, until health risks are mitigated, and the virus spread is hindered.

In this regard, many countries' logistics systems will be tested. Speed of action, quality of logistics infrastructure, connectivity, and many other components of freight resilience will matter to ensure that countries are supplied with Covid-19 vaccines without delays and at minimum cost.

[7] World Economic Outlook 2021, IMF.

LONG-TERM TRENDS IN FREIGHT

The future of freight will be shaped by longer-term challenges associated with technology and new geographical patterns

The world is rapidly changing and the speed of change, in particular due to increasing technological innovation, is going to increase over the coming years. The transportation industry is bringing new cutting-edge technologies to land, air and maritime freight which will have a major impact on the global economy. New logistics technologies also create new opportunities, bringing new solutions that can help to facilitate administration and workflows in logistics to better navigate trade.

These global challenges put significant pressure on the logistics sector, which needs to meet the demands of rapid technological advancements, decarbonisation of freight sector and shift of trade flows towards growing markets in Asia.

RAPID DIGITALISATION

New technologies will drive efficiency and security in logistics

Technology influences all dimensions of people's lives and shapes the behaviour of individuals and industries. The freight industry is not an exception, as technological readiness makes countries more resilient by enabling them to quickly adapt to unexpected shocks and supply chain disruptions. The key technologies that are affecting freight industries are:

1. Growing share of e-commerce in the retail market, accelerated by the impact of Covid-19.

In light of Covid-19, the share of e-commerce as a percentage of the retail market has increased in many countries. For example, in the UK, while the share of e-commerce in retail increased from 17.3% to 20.3% between the first quarter of 2018 and the first quarter of 2020, it dramatically shot up to 31.3% in the second quarter of 2020[8]. OECD estimates suggest that online orders rose significantly across many regions in the first half of 2020, including Europe, North America and Asia-Pacific. However, not all countries are technologically ready for the rise of e-commerce.

2. Rising use of IoT, or the Internet of Things, in the freight industry to track shipments and their conditions.

For example, the Digital Journal states that the IoT fleet management market is expected to grow to $16.86 billion in 2025 (from $942.6 million in 2015) at a compound annual growth rate (CAGR) of 20.8%.[9] IoT in fleet management allows the fleet operators to automate various processes and trip planning.

3. Machine learning allows data to be analysed and patterned for business decisions to be made by computers.

According to global research by Markets and Markets, the AI in supply chain market is expected to grow at a CAGR of 45.55% from 2018 to reach $10.11 billion by 2025.[10]

4. Robotisation and automatisation of processes optimises operations and increases productivity.

The use of robotics in the logistics sector is rapidly growing. The logistics robotics market grew 162% from 2016 to 2017, as the International Federation of Robotics World Robotics 2018 Service Robots report stated. It is estimated that the market will experience an annual growth rate of 18% between 2019 and 2021.[11]

DECARBONISATION

The decarbonisation trend will force the logistics sector to find alternative ways of doing business to reduce its carbon footprint

Decarbonisation of the logistics sector is one of the most important areas for reducing carbon

[8] OECD, E-commerce in the time of Covid-19
[9] http://www.digitaljournal.com/pr/3708382
[10] https://blog.marketresearch.com/how-artificial-intelligence-can-build-sentient-supply-chains
[11] https://www.robotics.org/service-robots/logistics-robots

footprint. Road freight alone accounts for about 9% of global carbon dioxide emissions.[12]

In the beginning of 2020, the International Maritime Organization started banning ships from operating on fuel containing more than 0.5% sulphur. The aim is to decrease sulphur levels in the atmosphere and, in turn, to lower the risk of respiratory conditions such as asthma.[13]

In the road freight sector, the policy agenda is pushing more eco-driving, which is more cost-effective than alternative fuels for heavy vehicles. In developing countries, reducing "black carbon" emissions through renewing truck fleets is one of the key policy directions.[14]

Additionally, Nordic countries are actively taking actions to reduce carbon emissions in the maritime shipping sector. Since January 2015, most Scandinavian coasts are included in the Emission Control Areas (ECA), which aim to limit the sulphur (SOx) content of ship fuels to 0.1% in the Baltic and North Sea. In addition, in some Nordic countries' ports, national shipping associations and companies have volunteered their own targets for carbon neutrality.[15]

The Logistics Performance Index 2018 (LPI) survey also confirms the on-going trend towards sustainable supply chain management, in particular for environmentally sustainable services (green logistics). Among the LPI top performers (upper quintile), 28% indicated that shippers often or nearly always ask for sustainable and green options. In the second-highest quintile, the share of similar responses drops to 14%, and falls even further in the third (9%), fourth (7%) and fifth (5%) quintiles.

SHIFT IN GEOGRAPHY

Trade hubs are beginning to shift to Asia and trade flows are moving towards emerging economies

Globalisation and increasing freedom of trade flows have resulted in the rise of new market players and a shift in trade geographies. The latest trade figures show the following trends in terms of regionalisation and global trade flows:

1. Growing markets of Asia and Africa

Trade flows gradually shifting from advanced economies in the Western hemisphere to developing economies in Asia and Sub-Saharan Africa. According to the IMF (2020), 70% of global exports go to advanced economies. However, based on data from 2015-2019, the annual growth of global exports to these countries stood at 3%, whilst this figure for emerging Asia was 6%. Moreover, the annual growth of global imports from emerging Asia was 4.02% and 4.33% from Sub-Saharan Africa, compared to 3.2% in advanced economies and the Western hemisphere.

2. Trade competitiveness of China

From 1990 (the year often associated with the rise of modern globalisation) to 2019, total global merchandise trade as a share of GDP grew at an annualised rate of 1.3%. The era of globalisation also brought countries that were previously isolated into the global economy. Most notably, China is now the world's largest merchandise exporter, accounting for 15% of total global merchandise export volumes in 2019, whereas its contribution to global trade in 1990 was less than 1%. According to research by the IMF (2020), China is the largest exporter and the second largest importer in the world. It exports mainly to Western countries and its closest neighbours, but

[12] World Economic Forum, 2021
[13] 2020 Trends in Freight Transportation, and the COVID-19 Impact, Logistics Burreau
[14] "Towards Road Freight Decarbonisation Trends, Measures and Policies", International transport forum, OECD, 2018 https://www.itf-oecd.org/sites/default/files/docs/towards-road-freight-decarbonisation_0.pdf
[15] ITF (2020), "Navigating Towards Cleaner Maritime Shipping: Lessons from the Nordic Region", International Transport Forum Policy Papers, No. 80, OECD Publishing, Paris

mainly imports from its Asian neighbours (Korea, Japan).

3. Increasing role of regional trade agreements

According to the Regional Trade Agreements database of the WTO, for the last 20 years, the number of RTAs has been growing at a rate of 7%, and the number of notifications to RTAs at a rate of 9%.

Regional trade agreements (RTAs) significantly influence trade policies and freight flows. Grouping countries according to their RTAs (Table 8 in the next section) shows that countries mostly have similar levels of economic, institutional and technological development, which are the contributing factors to freight resilience.

RESULTS OF THE GFRI 2021

GFRI PERFORMANCE AND KEY COUNTRY CHARACTERISTICS

Singapore is the most resilient country in terms of freight and logistics

Singapore, the Netherlands and Denmark display the most resilient freight sectors in the world according to the Global Freight Resilience Index 2021 which ranks 131 countries and economies on the resilience of their logistics sector. The top three countries are followed by Switzerland, Sweden, UK, UAE, New Zealand, USA and Finland (Table 5).

Singapore tops the GFRI 2021 rankings, as it has over the last five years, based on its strong and balanced performance across many dimensions of freight resilience (Table 5). Singapore is the top performer in both policy opportunity and freight performance pillars.

Singapore has made the extraordinary progress in trade connectivity and infrastructure in the last five years (27% increase). Even today, in times of US-China trade tensions, Singapore is leveraging its innovation potential and geographic proximity to China to enhance its logistics capability and become a trade hub for Chinese tech companies[16].

Table 5. Overview of GFRI 2021 results for top 10 countries

Country	GFRI 2021 Rank	GFRI 2021 score	1. Policy Opportunity pillar rank	Policy Opportunity pillar score	2. Freight Performance pillar rank	Freight Performance pillar score	Trend (2016-2021)
Singapore	1	85.5	1	86.4	1	84.7	0
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Denmark	3	80.3	3	84.8	8	76.0	4
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Sweden	5	78.5	5	83.2	10	74.1	-2
UK	6	78.2	10	79.7	4	76.8	-1
UAE	7	77.9	9	79.8	7	76.1	11
New Zealand	8	77.2	6	82.6	12	72.2	-6
USA	9	77.2	2	85.0	19	70.2	-5
Finland	10	77.2	4	84.5	17	70.5	-4

Source: Whiteshield Partners

The top 10 of the Index is balanced across resilience dimensions with some exceptions

Most countries with high levels of freight resilience have strong and balanced performance across the sub-indices of policy opportunity and freight performance. However, there are some exceptions, such as the USA and Finland, who have a relatively large gap between two pillars. Both countries have strong performance on policy opportunity (USA ranked 2nd, Finland ranked 4th), but they are relatively weaker on freight performance (USA ranked 19th, Finland ranked 17th) compared to their peers. Finland should put a greater focus on trade integration and facilitation (ranked 21st) and trade connectivity (26th), while the USA should further leverage its high technological readiness (1st) to enhance its logistics efficiency.

Overall, the top resilience league is mostly comprised of advanced economies with developed institutions, strong public sector performance and favourable business environments.

[16] https://www.bbc.com/news/business-54172703

Countries with strong institutions are better equipped to tackle potential freight challenges

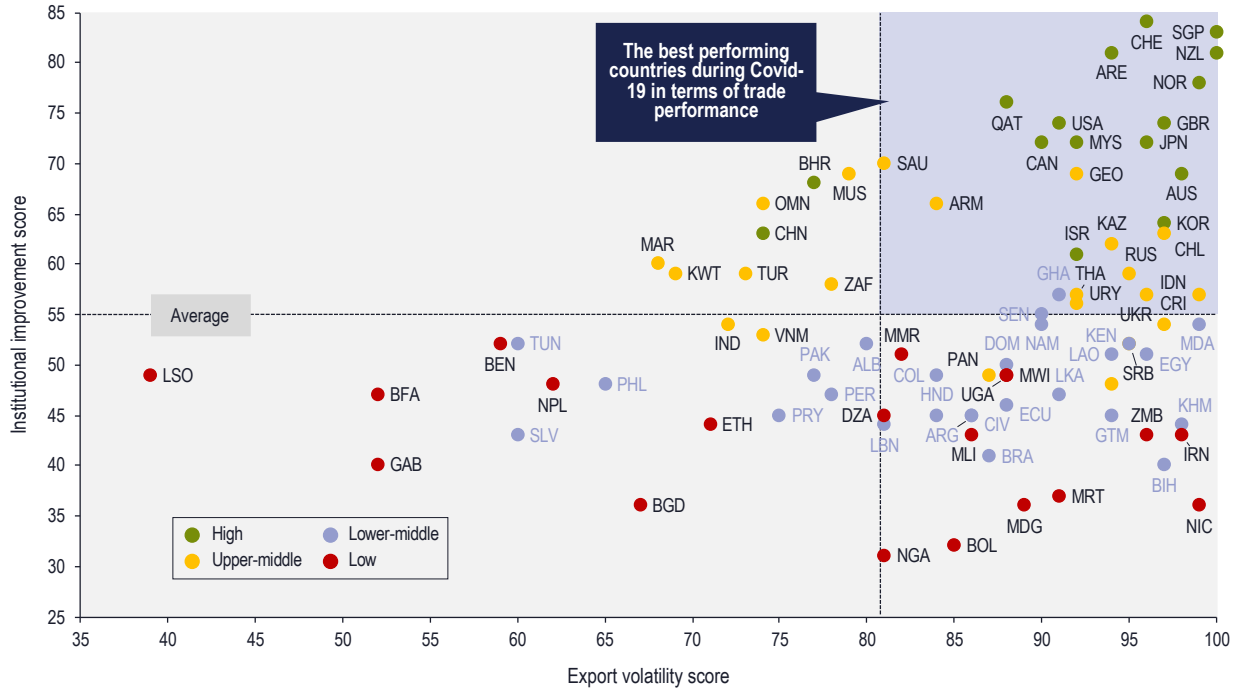
Strong institutions facilitate communication and decision-making at a lower level with more effective engagement of local departments with both freight stakeholders and private companies to ensure that critical issues are addressed in a holistic manner. This also allows for greater flexibility in terms of crisis response, which was a common challenge for many governments during Covid-19 while addressing stimulus packages. According to the OECD, many states have experienced coordination challenges between national and subnational governments. Less than half of respondents (49%) from the joint CoR-OECD survey, representing local governments in the EU consider that vertical coordination mechanisms with central government have been effective.[17]

Better communication across different stakeholders in the freight ecosystem also allows for greater flexibility of trade policy. During Covid-19 countries with weak institutional improvement scores were more vulnerable to exports reduction, as illustrated in Figure 3. For example, the Netherlands was able to use the high level of flexibility in the governance of its customs services to its advantage during Covid-19 (ranked 7th in institutional improvement). In 2020, the Dutch Customs postponed the imposition of fines if businesses do not comply with customs obligations on time due to Covid-19 crisis[18].

In addition, strong institutional capacity leads to effective communication between the government and the private sector. For example, to keep supply chains open, New Zealand's Ministry of Foreign Affairs and Trade worked in collaboration with other government agencies to help exporters through a variety of mechanisms, including updated information on air freight support, NZ marketplace (an online marketplace to help New Zealand exporters find offers and requests for resource), government packages and support, international market updates, webinars, trade shows and events, useful tools and resources (ranked 4th in institutional improvement)[19].

[17] OECD, 2020, The impact of the COVID-19 crisis on regional and local governments: Main findings from the joint CoR-OECD survey
[18] Dutch Customs authorities' Notices
[19] New Zealand, Ministry of Foreign Affairs and Trade, https://www.mfat.govt.nz/en/trade/covid-19-and-trade/

Figure 3. Relationship between institutional improvement and export volatility during Covid-19 segmented by GFRI performance



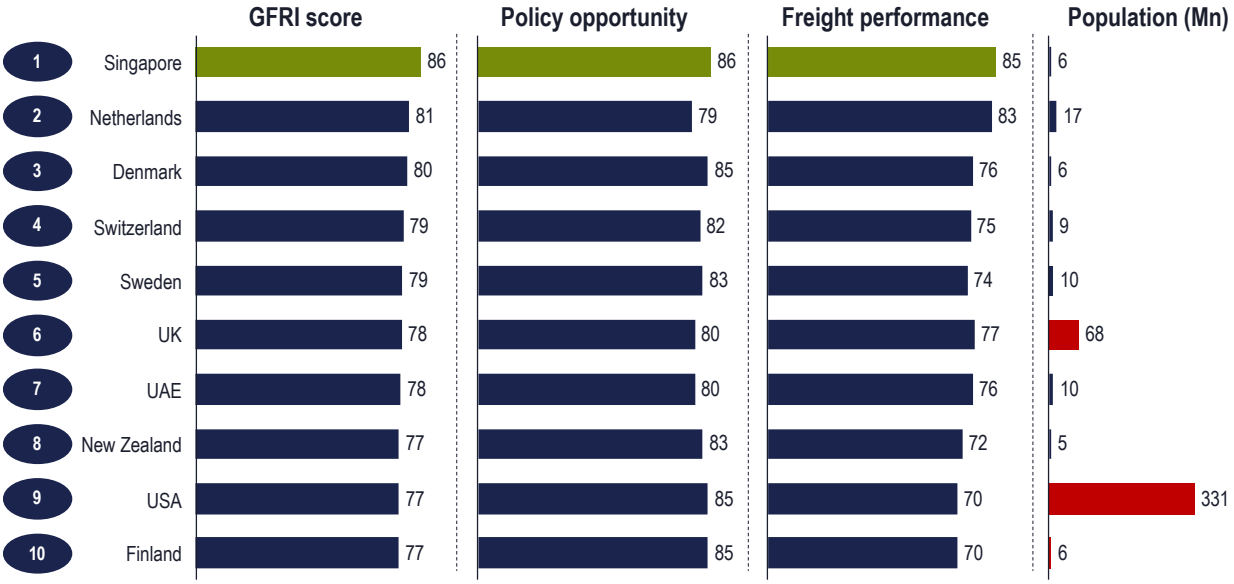
Note: Export volatility is based on Q2 2020 UNCTAD estimates. It tracks export performance across the last 4 quarters. A greater score implies lower vulnerability
Source: Whiteshield Partners, UNCTAD

GFRI and population size: the small country double edge

The top 10 ranking of the GFRI is clearly dominated by smaller countries (Table 6). The USA and the UK are the only countries that stand out with a population of above 20 million.

It appears that all things equal (and especially considering key characteristics such as income and development levels), smaller countries seem to have a resilience primer related to policy opportunity. This can be explained by several factors ranging from lower spatial disparities, government closeness to the population, relative speed and ease of regulation and policy implementation in order to spur change. Smaller countries in the top 10 perform particularly well on their institutional improvement and trade connectivity and infrastructure.

Table 6. Performance of the top 10 countries across the dimensions of the GFRI and population size



Source: Whiteshield Partners

HISTORICAL PERFORMANCE

Global freight resilience is increasing over time with declining freight performance

Global freight resilience is rising. Over the last five years the average GFRI score for countries has increased by 7%, supported by better performance on policy opportunity front (11% increase), while freight performance has been evolving in the opposite direction (3% decrease) (Figure 4).

Low-income countries have shown the strongest growth in freight resilience over the last five years (9% increase). In particular, Myanmar, despite being the lowest performing country in the East Asian region, has shown the most impressive evolution of freight resilience with a 47% increase in its GFRI score mainly due to enhanced technological readiness which has increased almost 3-fold since 2016. Mongolia, El Salvador and Venezuela are among the countries which have seen significant falls in their levels of freight resilience.

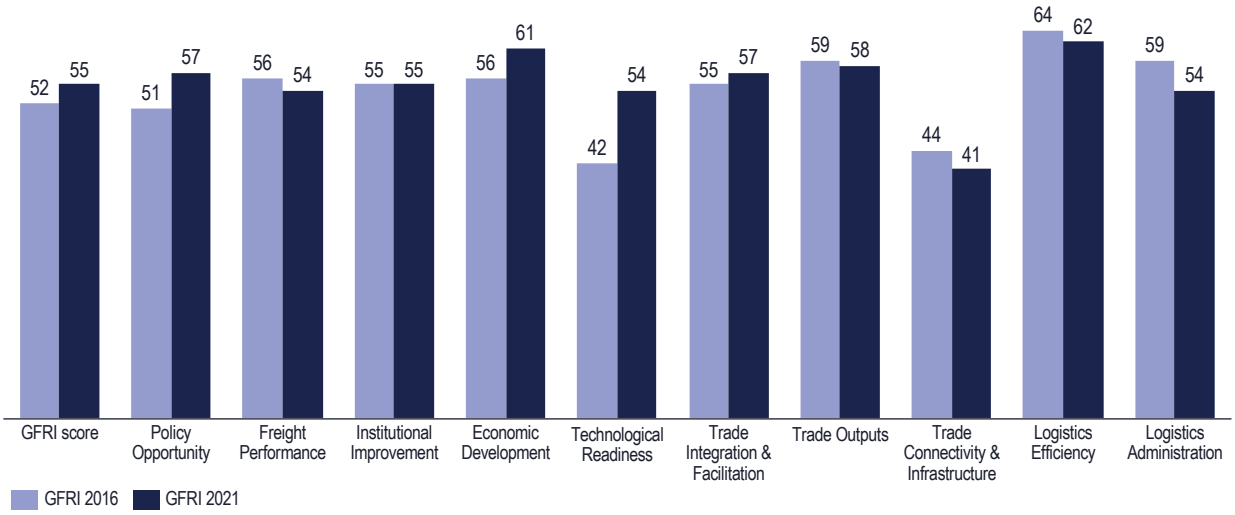
Technological readiness is increasing at a higher pace compared to other dimensions of the GFRI

According to the GFRI 2021, countries are improving rapidly in terms of technological adoption and digital transformation. The overall score for the technological readiness sub-pillar, which consists of four indicators, mobile phone subscriptions, internet use & affordability, government digitalisation and country digital readiness, has increased by 27% over the last five years. Countries and territories across the GFRI should leverage their advancements in technological readiness to enhance logistics efficiency and increase trade outputs to ensure higher economic growth alongside a resilient logistics sector.

On the other hand, trade connectivity and infrastructure and logistics administration have experienced the highest drop over the same period. In particular, Sub-Saharan African countries with low-income levels saw a reduction in trade connectivity and infrastructure. A limited number of countries can boast improved logistics administration over the last five years. Yemen has

the highest increase in logistics administration, however overall resilience has been stable due to a significant deterioration of scores in technological readiness and trade connectivity & infrastructure.

Figure 4. Evolution of GFRI scores (GRFI 2016 vs GFRI 2021)



Source: Whiteshield Partners

GEOGRAPHICAL PERFORMANCE

North America remains the leading region in the Global Freight Resilience Index

The Global Freight Resilience Heat Map highlights the disparities in freight resilience across the world in Figure 5. Table 7 provides a comparative summary of regional results by sub-pillar.

Six of the top 10 best performing countries in the Global Freight Resilience Index are in Europe – Singapore, the USA, UAE and the New Zealand are the only countries outside of Europe to feature. North America remains the best performing region overall with average score of 73, although this is helped by the small number of countries in the region, the USA and Canada. Europe takes second place with an average score of 67, which is significantly lower than that of North America, which indicates the presence of inequality between European countries. For example, in Europe, there is a gap of 81 positions between the best and worst performing countries which are the Netherlands (ranked 2nd) and Bosnia and Herzegovina (ranked 83rd).

Countries in the East Asia & Pacific region are the most unequal in terms of freight resilience

East Asia & Pacific is represented by top performing countries such as Singapore (ranked 1st) and New Zealand (8th). However, despite the dominance of East Asia & Pacific amongst resilience leaders, the region has the highest level of intraregional inequality. For example, there is a gap of 108 positions between the best and worst performing countries and territories which are Singapore (ranked 1st) and Myanmar (ranked 109th).

In order to estimate regional inequalities, we can score regions based on the standard deviation of their countries' performance (Table 7). East Asia & Pacific has a standard deviation of 13, while the best performing region in terms equality of freight resilience is Central Asia & South Caucasus, which has a score of 6.

Although the countries of Sub-Saharan Africa are relatively balanced in terms GFRI scores (standard deviation of 8), the region shows has the lowest average GFRI score (43). However, the distance to the best performing region of North America has decreased significantly from 37 to 29 over the past five years.

Most of the regions have experienced a positive progress in freight resilience over the last five years

Over the last five years, most regions have experienced positive progress in enhancing freight resilience. South Asia and Sub-Saharan Africa have experienced the highest progress, increasing their performance by 10%. North America is the only region that have experienced a 5% reduction in their GFRI score over the same period.

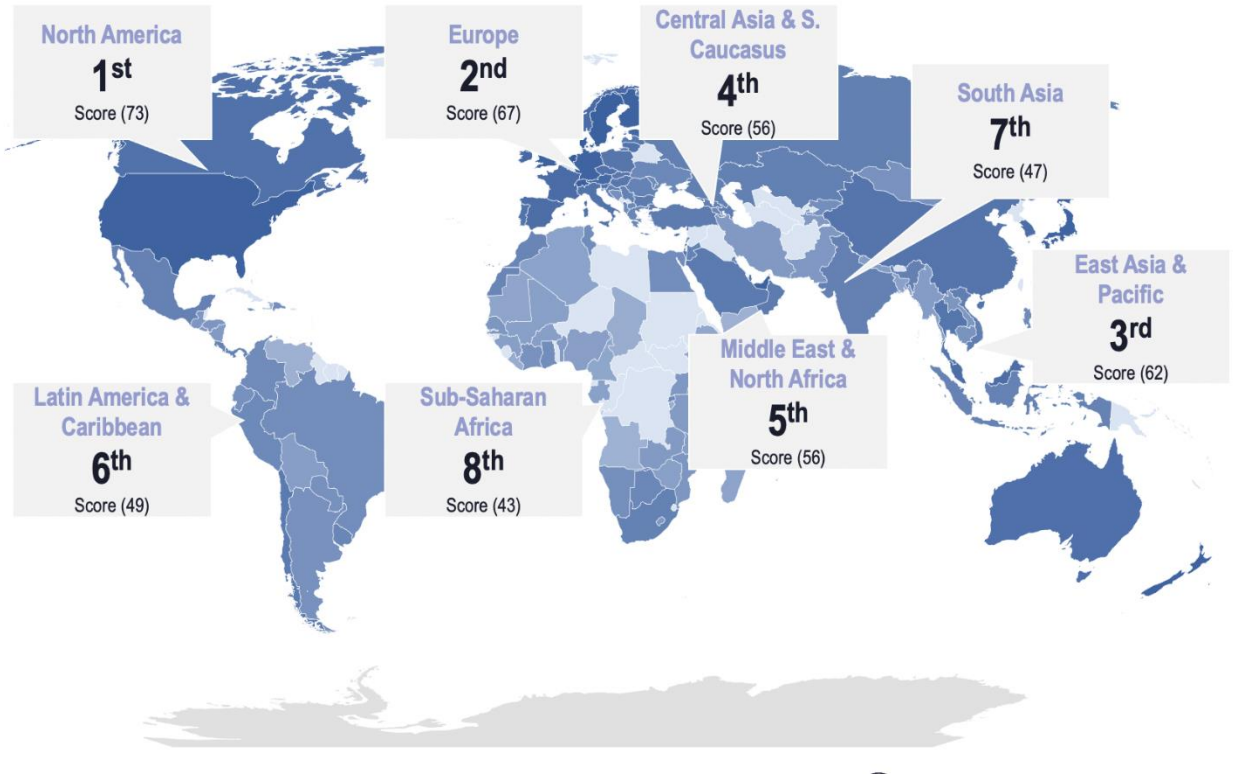
Moreover, between 2016 and 2021 all of the regions have progressed to tighten the gap to North America, and this progress is significant. For example, countries in South Asia and Sub-Saharan Africa have reduced the gap to North America by 9 and 8 points respectively.

Table 7. Average GFRI 2021 performance by region

Country	GFRI Regional Rank	Number of Countries / Territories	Average GFRI Score	Level of inequality (standard deviation)	Average Policy Opportunity pillar score	Average Freight Performance pillar score
North America	1	2	73	6	80	66
Europe	2	34	67	9	68	66
East Asia & Pacific	3	15	62	13	64	61
Central Asia & S. Caucasus	4	8	56	6	61	52
Middle East & North Africa	5	15	56	12	58	54
Latin America & Caribbean	6	21	49	8	50	48
South Asia	7	5	47	7	49	45
Sub-Saharan Africa	8	31	43	8	43	44
Overall World Average		**131**	**55**		**57**	**54**

Source: Whiteshield Partners

Figure 5. Global Freight Resilience Index performance across the globe



Note: Darker colour implies higher resilience
Source: Whiteshield Partners

Countries included in regional trade agreements can share similar patterns in freight performance

Regional trade agreements (RTAs) significantly influence trade policies and freight flows. Grouping countries according to their RTAs (Table 8) shows that countries mostly have similar levels of economic, institutional and technological development, which are the contributing factors to freight resilience. Hence, advanced economies are characterised by developed policy institutions, strong trade infrastructure and high levels of multimodality, while most of them have low export market penetration. These groups of countries must diversify their trading partners to ensure their freight sector is resilient to future shocks. On the other hand, emerging economies have great potential in trade development, although they have to enhance their institutional environment, become more open to trade and improve freight performance through digitalisation and infrastructure development.

Table 8. The GFRI performance by groups of regional trade agreements

Union	Political and regulatory stability	Economic development and technological readiness	Development of trade infrastructure and connectivity	Trade openness and export market penetration
APEC (Asia Pacific Economic Cooperation)	High	High	High	Medium
EU (European Union)	High	High	High	Medium
NAFTA (North American Free Trade Agreement)	High	High	High	Medium
ASEAN (Association of Southeast Asian Nations)	Medium	Medium	Medium	Medium
AL (Arab league)	Medium	High	High	Medium
EEU (Eurasian Economic Union)	Low	Medium	Low	Medium
LAIA (Latin America Integration Association)	Low	Medium	Medium	Medium
AU (African Union)	Low	Low	Low	Low

High Medium Low

Note: The scores for political and regulatory stability, economic development and technological readiness, Development of trade infrastructure and connectivity, Trade openness and export market penetration were calculated as average score of countries and then compared to other groups.
Source: Whiteshield Partners

GFRI and income level: The top countries in GFRI are represented mostly by high-income countries

Income groups remain a good overall predictor of policy performance with a strong correlation between GFRI scores and GDP per capita (0.8 correlation).

Countries performing above the upper quartile in the GFRI 2021 are all high-income countries with the exception of two upper-middle income countries: Malaysia (ranked 23rd) and China (ranked 33rd).

Inequality in freight resilience between income levels is particularly high between high-income countries and the rest, with the largest gap reaching 30 points between high- and low-income level countries. However, this gap is narrowing, as the distance to high-income countries has decreased by 2 points. At the same time, the gap for lower-middle and upper- middle income countries to high-income group are also decreasing (by 1 and 2 points, respectively).

However, inequalities in freight resilience are also high within income groups, especially within the upper-middle and high-income segment

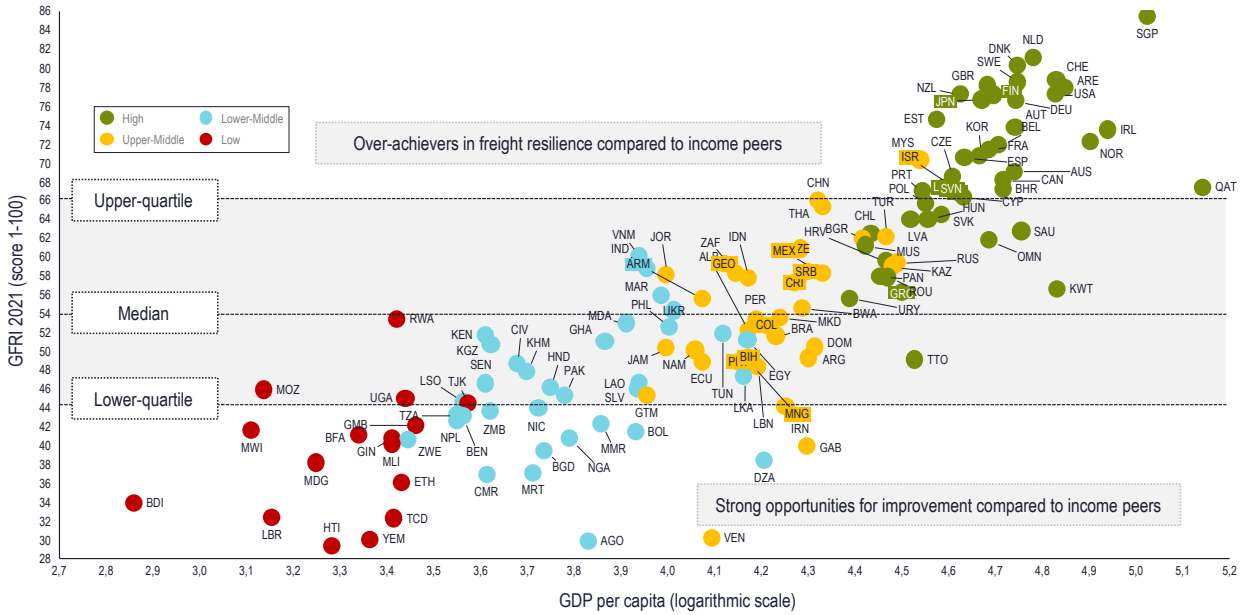
There are significant disparities within income groups and especially within the upper-middle and high-income groups where there is a wider distribution of scores. Again, in order to estimate the inequality within the income levels, we can analyse the standard deviation of their countries' performance.

High income group has a standard deviation of 8: 84 positions separate the top-ranked Singapore and the low-ranked Trinidad & Tobago.

Additionally, although there is a strong relationship between income levels and freight resilience performance, there are some exceptions— there are overachievers and underachievers. The overachievers have higher levels of resilience than predicted given their income level (above the median GFRI score but lower income level) and include countries like India, Vietnam and Morocco.

In contrast, the underachievers have lower levels of freight resilience compared to their above median income peers (above median of income level but low GFRI scores) (Figure 6). This group include countries like Iran, Gabon, and Venezuela.

Figure 6. GFRI performance vs GDP per capita



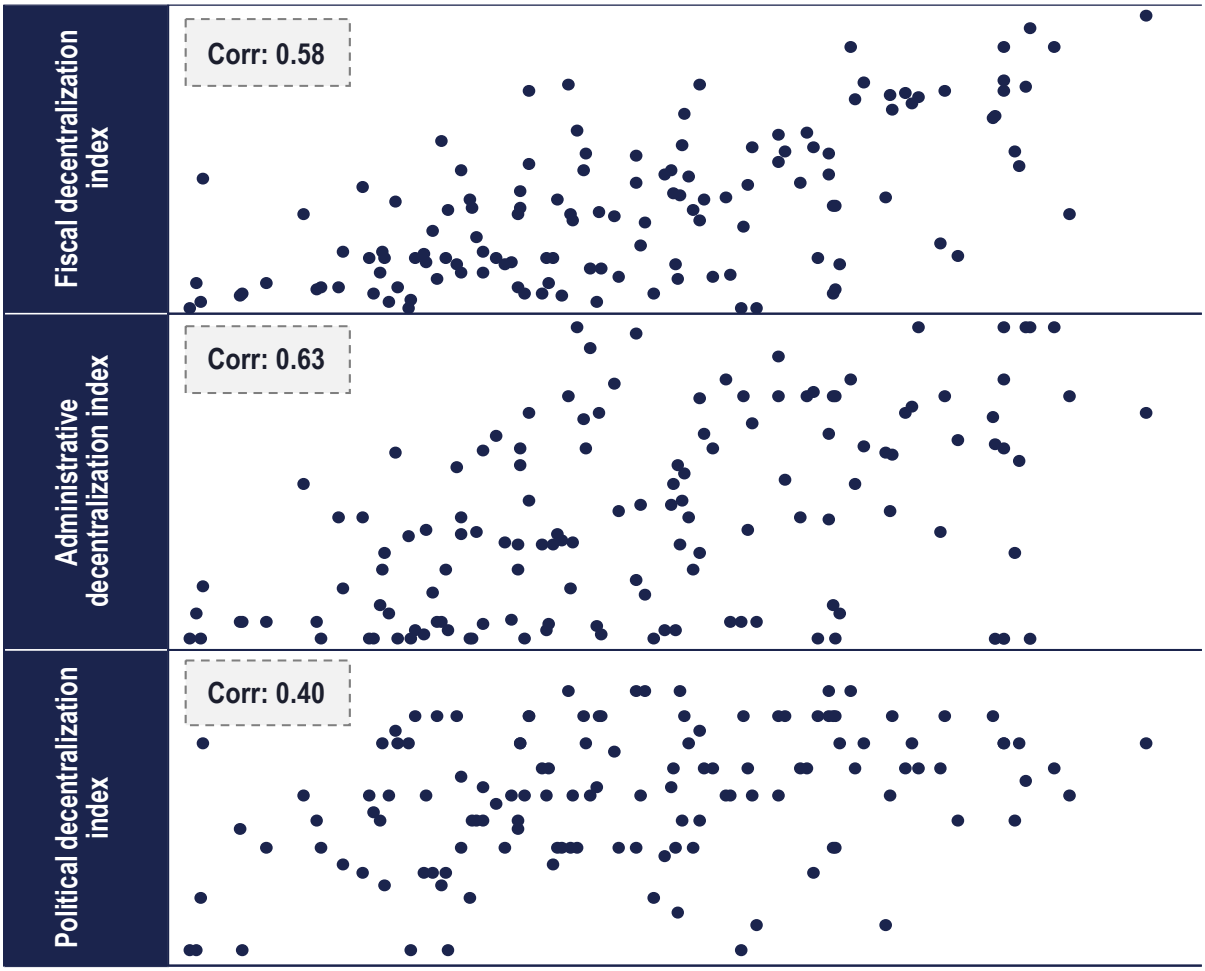
Source: Whiteshield Partners

GFRI and governance: Countries with decentralised governance models have higher levels of freight resilience

Covid-19 has given a new impulse to discussions on the ideal level of government decentralisation. Countries have taken alternative approaches during the crisis with some choosing to centralise decision making in times of crisis and others further reducing centralised powers. There are valid arguments on both sides of the discussion and the case for decentralisation is often focused on bringing power and decision making closer to those affected. It could be argued that local entities have a better level of understanding of local factors that cannot be achieved through briefing notes or econometric models. This local understanding can contribute to a reduction in the use of 'one size fits all' policies and lead to policy differentiation based on need.

The results of the Index have shown that there is a strong correlation between decentralisation and GFRI performance. Using data from the "How Close Is Your Government to Its People? Worldwide Indicators on Localization and Decentralization" dataset, it is clear that countries with higher levels of decentralisation score higher on the GFRI (Figure 7).

Figure 7. GFRI 2021 vs decentralisation



Source: Whiteshield Partners, "How Close Is Your Government to Its People? Worldwide Indicators on Localization and Decentralization" dataset

POLICY RECOMMENDATIONS

The changing nature of the logistics sectors will force many governments to revisit their freight strategies. In the new era of Covid-19 and the rapidly changing freight ecosystem, countries need to focus on the transition away from the traditional approach of addressing optimal and cost-efficient supply chains to resilient logistics. Resilient supply chains require activities beyond enhancing the quality and availability of key logistics services within a country and should encompass a whole-of-government approach where the public and private sector work in partnership. Institutional capacity matters in freight resilience as it works to build proactive resilience to any type of shock. As it was mentioned in the previous sections, countries with strong institutional capacity have performed better during the Covid-19 crisis.

FOUR CROSS-CUTTING POLICIES TO IMPROVE RESILIENCE

Building freight resilience in the context of globalisation will require a balanced policy response ranging from diversifying supply chains (enhancing multimodality) to addressing future skills gaps to ensure the future workforce is equipped with the necessary skills and competencies to handle future disruptions. Based on the Index analysis, there are four main blocks of cross-cutting policies, including strengthening the economic environment, enhancing institutional improvement, focusing on emerging logistic technologies and adopting sustainability measures in logistics.

STRENGHTENING THE ECONOMIC ENVIRONMENT FOR LOGISTICS

Enhancing multimodality for resilient supply chains

Freight performance highly depends on the effectiveness of logistics' networks and operational efficiency.

Multimodality allows the use of different types of transport for shipments with only one shipping contract of carriage with the forwarder. Such an approach is more efficient as it can reduce bureaucracy and improve communication. It can also lead to a shorter transit time.

For example, China-Europe freight flows from Chengdu demonstrated remarkable performance despite the COVID-19 pandemic. During the period of January-November 2020, over 2,000 trips were made, up 55 percent from a year ago. A large number of cargos was passed on to railway transportation, as maritime and air transportation have been impacted by the pandemic.

Since 2017, the Chengdu International Railway Port has launched a "single waybill" mechanism for multimodal transport in order to ease the burden of settlement and financing for foreign trade enterprises when they ship cargo to other countries on rail tracks. It has also connected 55 foreign cities and 18 Chinese cities, including 7 international rail routes and 6 international maritime-railway transport passages. It facilitated foreign trade of over $20 billion for China.[20]

Multimodal freight development relies on several tools, including high quality logistics infrastructure (like multimodal hubs in The Netherlands, Denmark and China), institutional support (private sector engagement, simplification of regulations and standardisation of processes, etc.), as well as technological progress.

Improving logistics infrastructure

Infrastructure development is comprised of clear infrastructure planning, digitalisation of services

[20] http://en.people.cn/n3/2020/1222/c90000-9801489-2.html

and creating "facilitating trade" logistics platforms and vehicles.

World-class infrastructure and processes have been developed by the Singapore logistics industry. The port of Singapore will be able to process the equivalent of 65 million standard shipping containers by the completion of the Next Generation Port 2030, making it the largest integrated facility in the world. It tests driverless automated guided vehicles, leverages intelligent sensors to recognise shipping issues such as piracy, and data analytics to predict spots of traffic congestion.

Within the aviation sector, there are plans to double the capacity of the airplane terminal. Air cargo is encouraged to use Singapore via advanced facilities and processes. There is the Airport Logistics Park for time-sensitive freight, cold-chain centres for perishables and regional express facilities for expanding e-commerce operations.

To facilitate trade, Singapore launched the world's first National Single Window in 1989, which digitized and streamlined trade permit approval processes. With over 35 government agencies on this platform, this required the entire government to change its mindset from "controlling trade" to "facilitating trade". Today, permits can be approved electronically using one e-document within minutes. An enhanced National Single Window is currently in the works in order to also integrate as many Business-to-Business transactions as possible.[21]

With evolving landscape, logistics sector is continuously demanding new skills

Logistics is one of the key factors of economic development and a strategic component of many industries. The sector also contributes significantly to job creation. For example, according to the World Bank, the logistics sector employs about 8% of the workforce in the UK.[22]

Those who work in the logistics sector require constant training and development due to the need for skills upgrades, such as communication and leadership skills (to create collaborative environments within supply chain teams), strategic planning and business analysis skills.

The development of new technologies in logistics brings great opportunities for increasing the productivity and efficiency of freight, but at the same time requires the workforce to develop new competencies to be competitive in the labour market. According to the Chartered Institute of Logistics and Transport (CILT), 54% of logistics firms are expecting skills shortages to increase over the next five years.[23] Countries should put a greater focus on developing new skills with a focus on robotics and automation, big data, anticipatory logistics and on-demand logistics solutions.

The Global overview "Logistics Competencies, Skills, and Training" by the World Bank, distinguishes between four occupation categories and states the skills gaps, including:

1. Operative logistics/blue-collar staff (truck drivers, forklift drivers and warehouse pickers)

These workers often have are less likely to embrace automation or new methods of working. Older generations may have less enthusiasm for trainings and are sceptical of new technologies.[24]

2. Administrative logistics staff (traffic planners, expediters, warehouse clerks, customs clearance officers and customer service employees)

They often have limited awareness of their role in the supply chain and cannot ascertain the impact of their actions, usually because of the "silo thinking" of managers.

[21] World Bank: Transport for Development
[22] World Bank
[23] https://ciltuk.org.uk/News/Latest-News/ArtMID/6887/ArticleID/22813/Logistics-sector-facing-severe-skills-shortage-in-next-five-years-CILT-finds

[24] Global overview "Logistics Competencies, Skills, and Training", World Bank, 2017. http://dx.doi.org/10.1596/978-1-4648-1140-1

3. Logistics supervisors (shift leaders in warehouses or team leaders in a traffic department)

There is a need to develop leadership and communication skills within supervisors. Moreover, supervisors need to learn more about business performance indicators and develop financial literacy in order to make data-driven decisions.

4. Logistics managers (managerial staff with higher-level decision-making responsibility)

This category also has to develop leadership skills, although they need to enhance long-term-planning simultaneously, as they are usually in charge of large teams.[25]

Countries should develop national skills gap databases following the example of the OECD "Jobs for Skills Database" which identifies shortages and surpluses of labour across different functions using advanced data gathering tools. The purpose of the program is to estimate current skills needs, skills gaps and emerging trends in skills needs within the country. The database will inform government policy of priority needs for training. Moreover, the database should be made publicly available to allow an informed public to make better decisions about their future education and employment. These national skills gap databases can be complemented by deep-dive initiatives focusing on the logistics sectors.

Singapore provides a useful example of a logistics skills framework developed by its Skills Future initiative. Jointly developed by industry experts, The Skills Framework for Logistics provides useful information on employment opportunities, career pathways, existing and emerging skills, and available training programmes.[26]

ENHANCE INSTITUTIONAL ENVIRONMENT

Political, economic, and regulatory environment is beneficial for freight sector

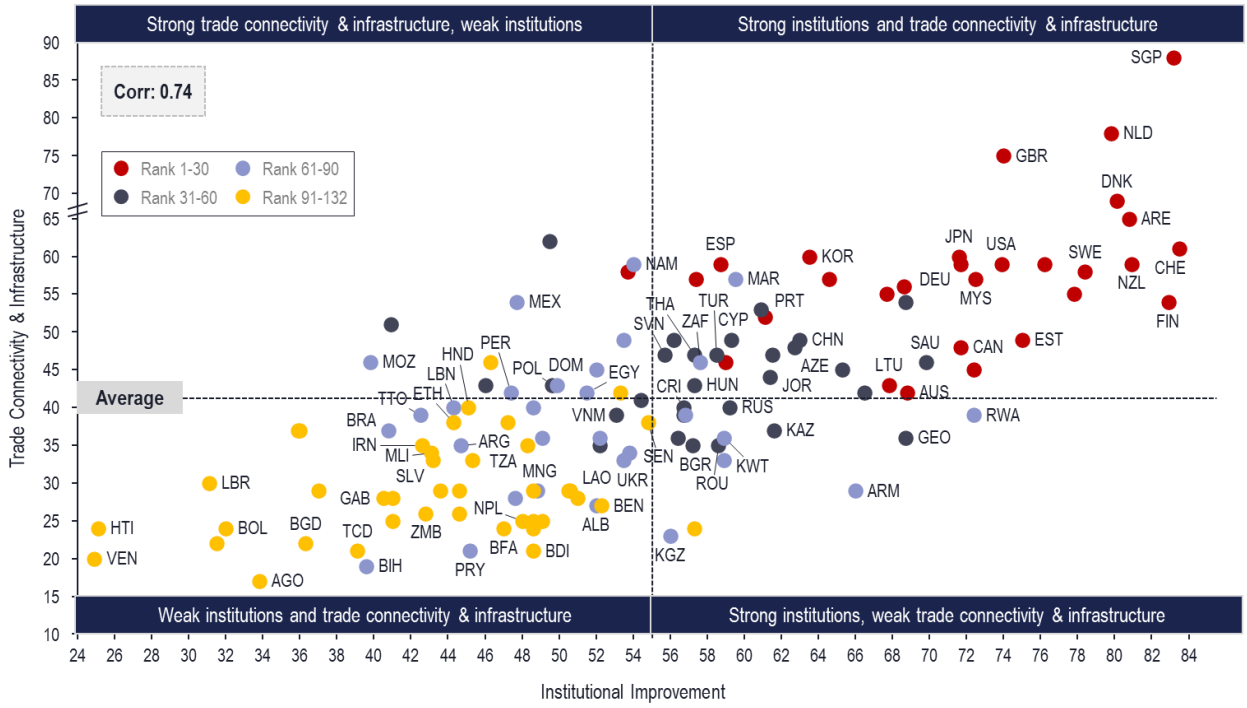
Political environment and institutional development influence the freight sector in different dimensions, starting from the favourable conditions for the private sector to the attractiveness for investors and establishing trade routes. As Figure 8 shows, institutions have a strong positive effect on trade connectivity and infrastructure. It could mean that the institutional environment accelerates trade integration of the economy and facilitates its openness to international markets.

Institutional support in freight reflects a favourable regulatory environment (simplification of procedures, ease of official document registration, protection of rights of freight forwarders and other), political stability, and economic policy measures (tariffs, quotas, private sector development and engagement, investment climate and other).

[25] Global overview "Logistics Competencies, Skills, and Training", World Bank, 2017. http://dx.doi.org/10.1596/978-1-4648-1140-1

[26] SkillsFuture Singapore

Figure 8. Relationship between institutional improvement sub-pillar of GFRI and trade connectivity & infrastructure



Source: Whiteshield Partners

Strong and inclusive institutions facilitate trade openness and stimulate innovative ideas through close cooperation with the private sector. Openness and stability of the political and institutional environment allows economies to engage in **trade integrations and create regional hubs** that foster the freight sector and expand markets.

In China, in order to increase efficiency and support intramodality, ports, freight stations, and logistics parks are recognized by the Government as priority areas for upgrading and expanding.

The Ministry of Transport of China established a public information platform for the logistics industry to support "information-based" logistics services. They develop basic data standards and data exchange specifications to facilitate the integration of various logistics information systems.

The Ministry of transport also cooperates with other relevant agencies in order to revise and draft logistics industry standards, conduct outreach and training activities, and introduce measures to encourage enterprises and government agencies to adopt the relevant standards. Lastly, as a supervisor, the Ministry is developing a quality and credibility assessment system for enterprises and employees for enhancing professional standards, as well as revising the standards for entry and exit to the industry.

The Government also actively encourage capacity development of third-party services by expanding operational scope and brand building. Moreover, the Chinese government promotes the technological advancement of logistics.[27]

[27] "Guide to key issues in development of logistics policy", UN ESCAP. https://www.unescap.org/sites/default/files/Logistics_policy_fulltext.pdf

World Logistics Passport initiative

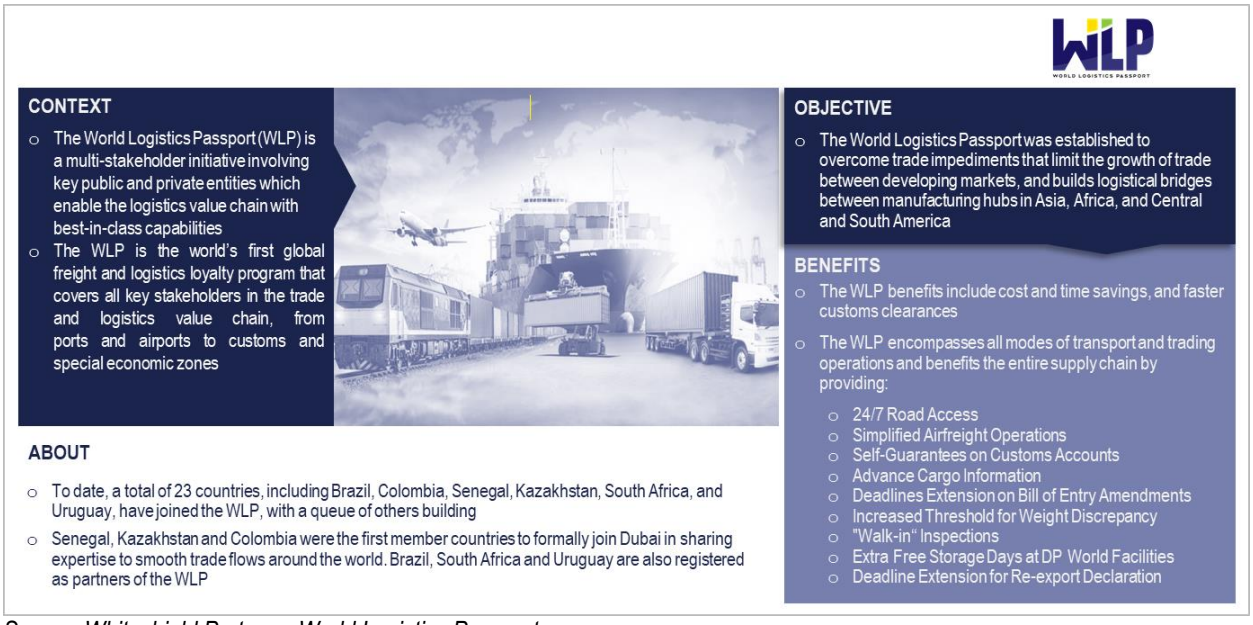
The World Logistics Passport (WLP) creates opportunities for business and governments to actively improve existing trading routes and develop new ones through the world's first logistics loyalty program for freight forwarders and traders.

The WLP is helping to reimagine how goods and services move around the world, to increase resilience in global supply chains and to remove the barriers that prevent developing economies from trading as freely as they might.

The WLP was established to overcome trade impediments that limit the growth of trade between developing markets, and to build logistical bridges between countries.

To date 23, countries are part of the WLP including Brazil, Colombia, Senegal, Kazakhstan, South Africa and Uruguay, with a queue of others building. Senegal, Kazakhstan and Colombia were the first member countries to formally join Dubai in sharing expertise to smoothen trade flows around the world. A description of the WLP is shown in Box 1.

Box 1. World Logistics Passport initiative



Source: Whiteshield Partners, World Logistics Passport

Addressing cross-cutting freight resilience challenges requires a whole-of-government approach and innovative partnerships with the private sector.

Based on the Global Freight Resilience Index 2021, the freight resilience framework is structured not only across freight performance indicators, but also across various dimensions of policy opportunity highlighting that freight resilience is a whole-of-government task.

Logistics challenges highlighted in the Report require partnerships between the public and private sector (PPPs), which are potential mechanisms to fund and develop logistics infrastructure.

South Korea offers useful insights to promote PPPs in logistics sectors. The Korean PPP Act and the PPP Enforcement Decree is designed to regulate general procurement procedures for PPP projects to ensure active participation of private sector companies. PPP investments helped to accelerate the realisation of social benefits of infrastructure projects.[28] The PPP Act clearly defines the role of the public and private sector, eligible infrastructure projects, procurement procedures, and ensures strict government regulation in property management.

FOCUS ON EMERGING LOGISTICS TECHNOLOGIES

Moving freight is a complex operation that involves many players such as port operators, freight forwarders, container depot operators, hauliers, and third-party logistics service providers. Many processes in this sector are still highly manual and use independently operated systems that are not connected across the different parties in the chain.

Therefore, it is important to develop and implement advanced technologies to increase productivity and efficiency in freight.

Application of IoT and machine learning technologies in freight operations

An American company, Flock Freight, uses machine learning and automation for algorithmic pooling. It helps to combine shipments from several different customers on the same route (finds the best route) and unloads it into one truck. The shipment does not leave until its delivery time, providing an opportunity for more products to be added during the waiting period. This type of approach reduces the risk of damage by 21.2% compared to traditional less-than-truckload (LTL) shipping methods.[29]

Tesla, Audi and other giants of the industry are using artificial intelligence, telematics, and robotic technology to deliver autonomous vehicles. The rise of driverless trucks is another challenge for the logistics sectors, in the US alone trucking accounts for more than 5% of all full-time jobs.[30]

Another example—Polaris, a Canadian LTL carrier, is actively implementing technologies for operational effectiveness. The company already uses optical character recognition (OCR) to extract data from paper and electronic forms automatically.

In 2018, Polaris introduced new robotic process automation (RPA) to improve processes associated with customs applications. Polaris has automatised circa 85 percent of customs processes by using robotics. As a result, Polaris saves 2-3 hours in customs processing each day, and overtime is down 30-40 percent.[31]

Secondly, due to the global trend in the automation of jobs, robotisation and AI processing need to be implemented in routine processes to keep the industry competitive.

Implementation of AI in freight model

In November 2019, the Government of the Republic of Singapore launched the “Intelligent Freight Planning” project to deploy AI applications

[28] https://www.adb.org/sites/default/files/publication/29032/ppp-kor-v1.pdf

[29] https://www.app-scoop.com/blog/how-less-than-truckload-companies-can-benefit-from-modern-technologies

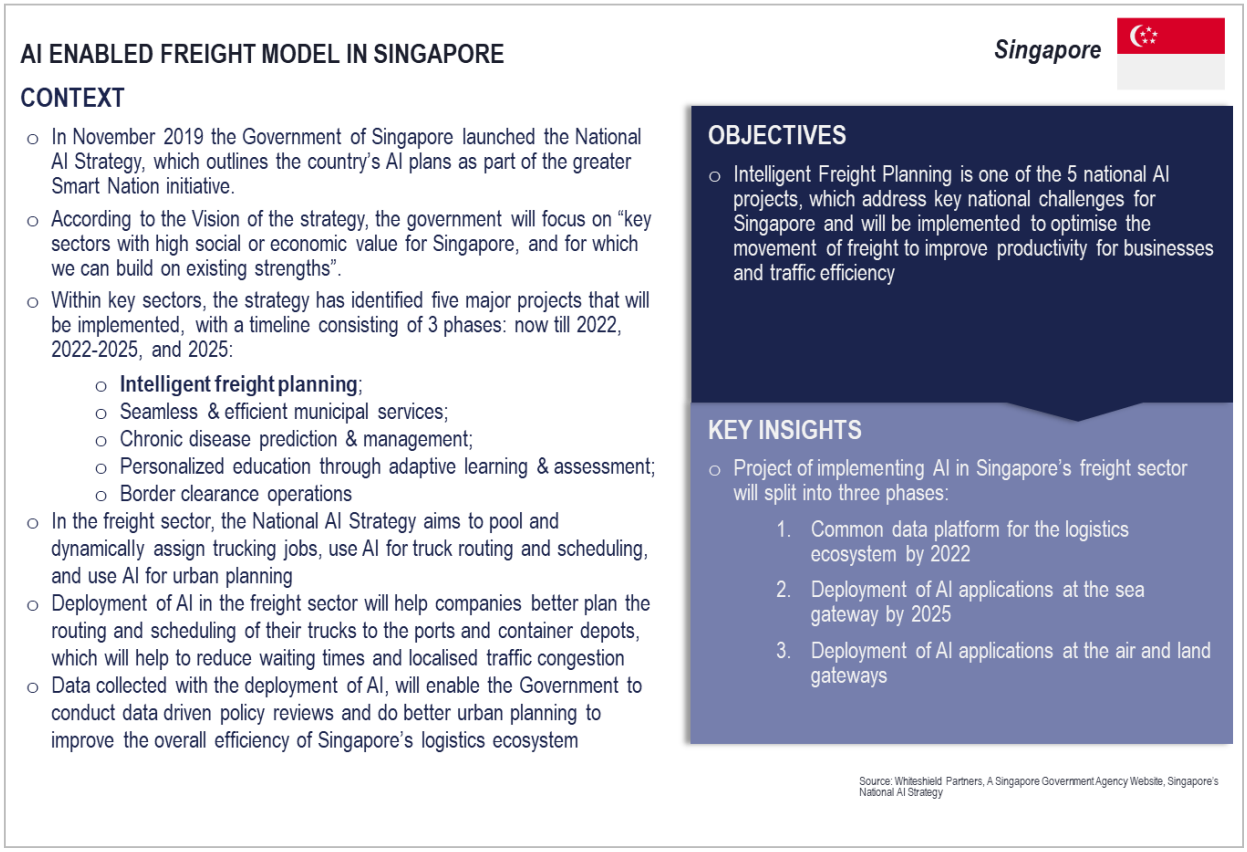
[30] https://markets.businessinsider.com/news/stocks/trucking-industry-facts-us-truckers-2019-5-1028248577

[31] https://www.ccjdigital.com/polaris-transportation-using-bots-to-automate-cross-border-freight/

in the freight sector to create a freight movement ecosystem where key parties leverage AI to share information and collaborate in an integrated manner. The aim of this is to enable more efficient freight and truck movement across Singapore.

Box 2 below discloses the case of Singapore in deploying AI applications in the freight sector.

Box 2. AI enabled freight model in Singapore



Source: Whiteshield Partners, A Singapore Government Agency Website, Singapore's National AI Strategy

ADOPT SUSTAINABILITY MEASURES IN LOGISTICS

Decarbonisation and green development for long-term sustainability

In addition to facilitating the technological shift and strengthening the institutional and economic environment, a fourth overriding objective for governments should be promoting the green transition.

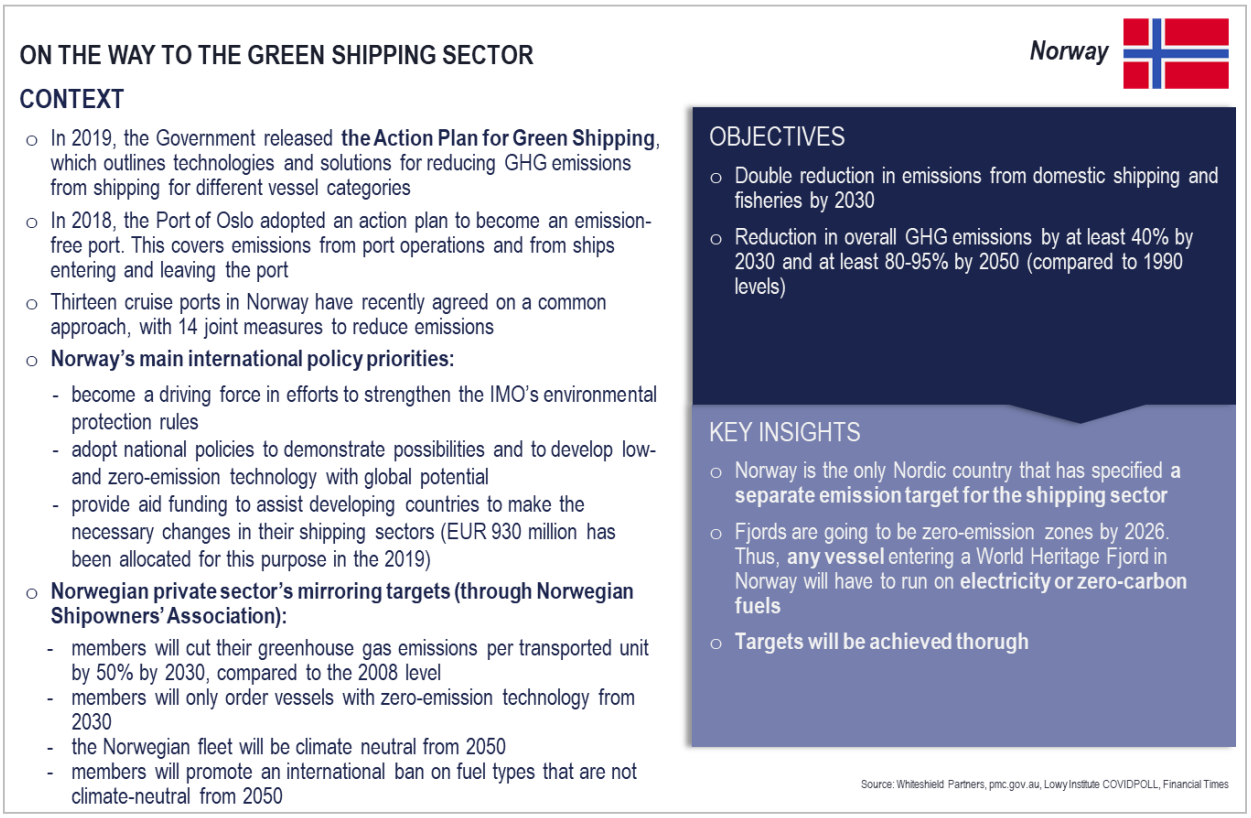
Adopting sustainability and the green transition to logistics is paramount to achieve the triple objective: (1) decreasing the environmental footprint around the world and mitigating the impact of the climate crisis on society; (2) increasing competitiveness of logistics firms in a world where sustainable economic models will inevitably become the norm; and (3) fully capturing new economic opportunities from the green transition.

The UN Sustainable Development Goals established a waterline for every state in adopting them in various levels of public policy. Freight cannot develop sustainably in the long-term without environmental measures such as adopting new legislation, creating conditions for the implementation of innovations aimed at reducing

emissions, and stimulating freight companies to follow "green" policies.emi

The commitment of governments to sustainable logistics should be a priority to stimulate private sector players to adopt green policies. For instance, Nordic countries are implementing legislation to actively reduce GHG emissions from ships. In 2019, the Scandinavian countries signed the Niulakita High Ambition Declaration on Shipping to commit to decreasing GHG emissions from international shipping, starting before 2023.

Box 3. Case of Norway in decarbonisation of shipping sector



Source: Whiteshield Partners, pmc.gov.au, Lowy Institute, COVIDPOLL, Financial Times

TAILORED POLICIES TOWARDS RESILIENCE

Implementing policies to enhance the resilience of the logistics sectors is a challenging exercise, in particular for low-income countries given their lower levels of technological and infrastructure development. Therefore, although all countries should aim to strengthen their economic environments, enhance their institutional environments, focus on emerging technologies, and adopt sustainability measures in logistics, as the aforementioned section argued, policies cannot be "one-size-fits-all" and must be adapted to the level of development of countries. In addition to cross-cutting measures, countries should consider specific policy recommendations based on their level of freight resilience.

Countries can be divided into four segments based on their overall resilience and urgency to act scores

Countries can be segmented into four categories based on their performance across the scores of the Urgency to Act and the Global Freight Resilience Index© 2021.

The Urgency to Act is defined as a freight resilience gap. It provides a measure of the magnitude of misalignment between a country's policy opportunities and its freight performance indicators.

Based on these criteria, four country segments can be identified: "Sustain Advantage", "Enhance Policies", "Unlock Performance" and "Focus Efforts" (Figure 9).

First, the group of countries with strong performance across resilience dimensions. This is mostly comprised of GFRI leaders with a balanced profile across the sub-indices of the GFRI, these countries should focus policies on continuous innovation to sustain their leadership position. They must utilise information and technology to innovate and create more efficient global trade routes and seek to establish international hubs for new markets and products.

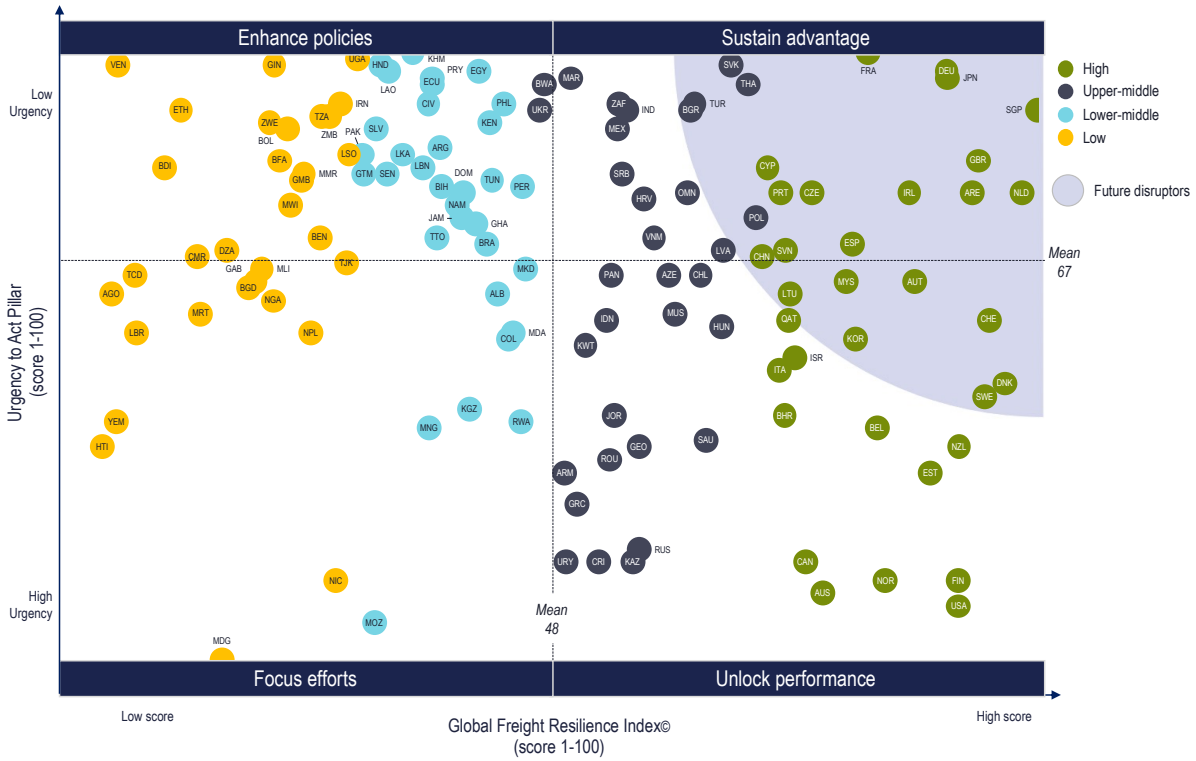
The second segment is comprised of countries that perform above average on their GFRI scores, but with an uneven performance across the resilience dimensions. The priority should be enhancing and strengthening the domestic market policy environment to sustain activities in trade and evaluating sustainable policy initiatives that encourage traders to support the local industry.

The third segment includes countries with relatively balanced scores across the resilience dimensions but lower overall resilience scores. These countries need to enhance their policy dimension by increasing investment opportunities through expansionary policies and incentives. On freight performance these countries need to benchmark global trade opportunities and increase connectivity and multimodal transportation logistics.

Finally, there is the unbalanced underperformers segment. These countries need to evaluate the trading position of their country and infrastructure requirements to increase trade potential and accelerate policy development focused on emerging capabilities and sustainable competitiveness in trade.

Detailed policy measures for the aforementioned segments are presented in Table 9.

Figure 9. Matrix: Urgency to act & Global Freight Resilience Index 2021 segmented by GFRI performance



Source: Whiteshield Partners

Table 9. Categories based on countries' performance across the scores of Urgency to act and Global Freight Resilience Index© 2021

Categories	Description	Focus area	Policy measures	Examples
Sustain advantage	GFRI Leaders with balanced performance	Continuous innovation to sustain leadership position by utilising information and new technologies	• Establish a centre for transport and logistics research • Accelerate alignment between regulatory frameworks and emerging trends in the logistics sectors • Foster innovation by providing R&D-related tax breaks	• Singapore's Next Generation Logistics Hub • Singapore's Committee on the Future Economy • Australia, Canada and France
Unlock performance	Above average performers, but with uneven scores across resilience sub-indices	Enhancing domestic market policy environment to sustain activities in trade and evaluate sustainable policy initiatives that encourage traders to support the local industry	• Foster competition and market discipline to forge an effective and efficient logistics system • Promote PPP mechanisms to support private finance in logistics • Invest further in logistics infrastructure across the country, as next source of competitive advantage • Implement new technologies to increase productivity of logistics (freight robotics, automatisation of processes, navigation systems) • Promote e-commerce development in retail market	• EU Antitrust Policy • Public-Private Partnerships for Infrastructure Development in South Korea • Chengdu International Railway Port • Singapore's AI in freight • USA, Canada, Norway
Enhance policies	Balanced scores on resilience sub-indices but lower scores in overall resilience	Increase investment opportunities through expansionary policies and incentives; benchmark global trade opportunities and increase connectivity and multimodal transportation logistics	• Promote access to finance for SMEs in logistics • Build a national skills gap database in logistics sectors in partnership with the private sector • Develop free economic zones, multimodal cargo hubs, logistics centres, and cold storage facilities • Implement new legal frameworks for multimodal transport operators • Provide the stability of regulations for investors	• The Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGS) in India for logistics companies • Singapore's Skills Framework for Logistics • Dubai • China's Uniform Rules for a Combined Transport Document
Focus efforts	Unbalanced underperformers in both policy and freight sub-indices	Evaluate trading positioning of country and infrastructure requirements; accelerate policy development focused on emerging capabilities	• Strengthen international and regional co-operation to enhance connectivity • Leverage digital infrastructure investments to enhance educational development and reduce digital divides within regions	• World Logistics Passport • South Korea's strategic investments in infrastructure

METHODOLOGY

Changes from previous year

For the 2021 edition of the Global Freight Resilience Index there are several changes to the methodology:

1. The possible addition, deletion or modification (at source) of indicators
2. A change in the weighting scheme that assigns indicators half or full weights within each sub-pillar
3. The final score is a computed as the geometric average of the two subindices (rather than as a weighted average of the two subindices and the Time Pressure measure)
4. Nomenclature: The Index is the highest aggregation followed by the subindex, pillar, and sub-pillar. The indicator is the base element of the indicator, although a few indicators are themselves composite indicators. In this case we refer to the elements that compose the base indicator as components

Framework

The GFRI is comprised of eight pillars. Three pillars are associated with the Policy Opportunity subindex. The remaining five are part of the Freight Performance subindex. The pillars are described below, along with a list of the indicators that compose each of the pillars.

Figure 10. The Global Freight Resilience Index framework 2021

Source: Whiteshield Partners

The Global Freight Resilience Index is a linearly additive composite indicator. It has four layers of aggregation from the underlying indicators to the index:
Indicator (35) ➔ Sub-pillar (14) ➔ Pillar (8) ➔ Subindex (2) ➔ Index (1)
Note, however, that some of the indicators are themselves composite indicators.

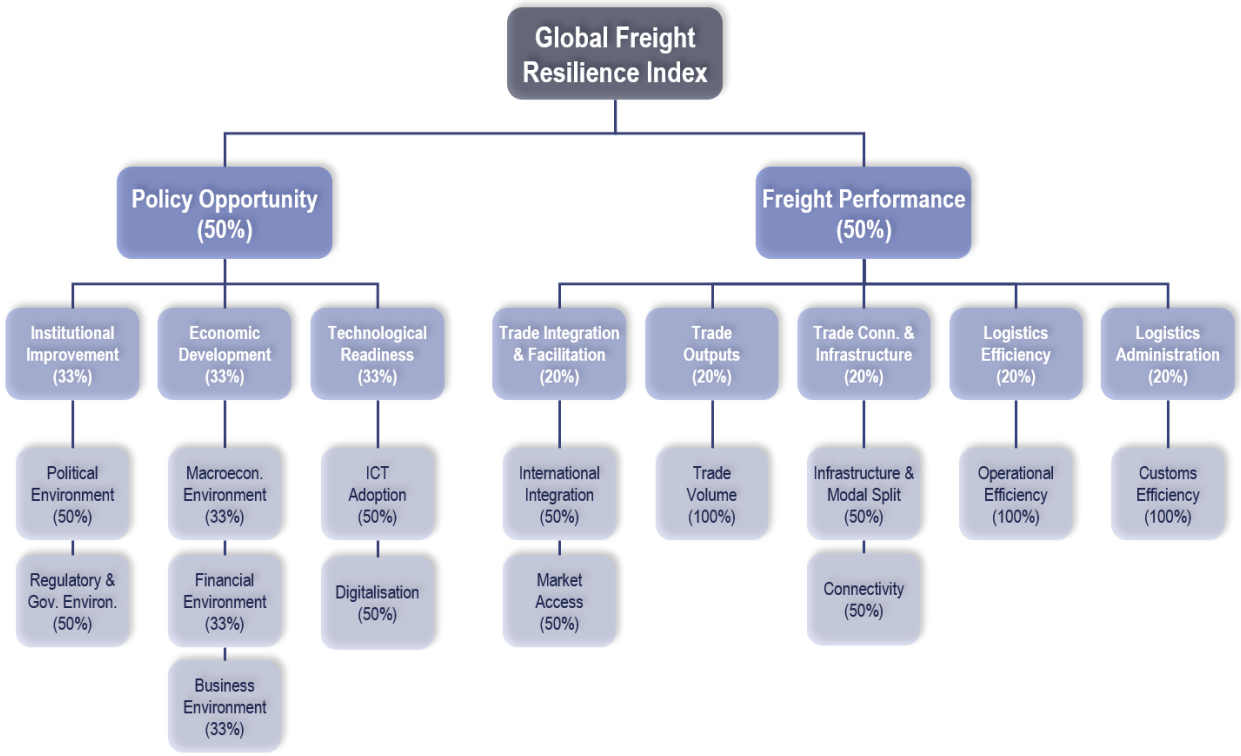
Aggregation

The GFRI score is the geometric average of its two subindex scores. The Time Pressure is calculated as the absolute difference between the two subindices but is not directly used in the calculation of the final Index score. However, the nature of geometric averages captures the spirit of Time Pressure as it penalizes differences in the value of elements that are averaged.

Weights

The Index is a fixed weight composite indicator. The weight of each successive layer in the Index is fixed. The weights of each successive layer of are equally distributed.

Figure 11. Index hierarchy & weights



Source: Whiteshield Partners

The final index score, however, is geometric average of the two subindices:

$$\text{Index} = (\text{Subindex1})^{0.5}(\text{Subindex2})^{0.5}$$

Outliers & skewness

Indicators are checked for statistical robustness before they are incorporated into the Index. Two general tests ae applied: skewness and kurtosis. The Index applies two general methodologies to handle outliers. Data are either winsorised (truncated) and/or the natural log of the indicator is taken. This is done in an ordered multistage process whereby data are first checked for skewness and outliers. Those identified with skewness greater than 1.5 or absolute kurtosis values greater than 2.25 are flagged for winsorisation. Winsorisation takes the form of assigning extreme values to the truncated value. If winsorisation is not sufficient, the natural logarithm is applied.

Normalisation

The GFRI uses a distance-to-frontier normalisation to convert indicator values into a unit-free measure that can then be aggregated across indicators. The formula for

$$s(x) = 100 * ((x - \min)/(\max - \min))$$

When the indicator is negative, the formula is

$$s(x) = 100 * (\frac{\max - x}{\max - \min})$$

The transformation scales indicators into the range [0,100].[32] Normalisation is not applied to values that have already been initially normalised. For example, certain indicators are taken from the source having already been normalised.

[32] This represents a small change from the 2020 Index in which the indicators were mapped to the range [1,100] using the normalization formula $s(x) = 99\left(\frac{x-\min}{\max-\min}\right) + 1$ for x a positive indicator.

Missing data

The Index does not consider missing data in the computation of the aggregated scores. Missing data are not imputed.

Data inclusion

Only indicators which cover at least 35 countries are considered. This filter is applied twice as the initial set of indicators first needs to cover at least 35 countries of the entire population of countries/economies. Second, it must then also satisfy covering at least 35 countries from the reduced list of economies/countries after economies with insufficient data coverage are eliminated from the Index.

Country coverage

The Index ranks 131 economies. We started with a list of all UN member nations (197). The Index only assesses economies with at least 2/3 data coverage at the index, subindex, and pillar levels. That is, for an economy to be ranked it must satisfy the ordered rules below:

1. The total number of valid indicators must be at least 2/3 of the 35 indicators that comprise the Index
2. The total number of valid indicators must be at least 2/3 of the number of indicators in each of the two subindices
3. The total number of valid indicators must be at least 2/3 of the number of indicators in each of the 8 pillars

If all of the three above conditions are satisfied, then the calculated score of the Index for a country is included in the final Index score/assessment

Date

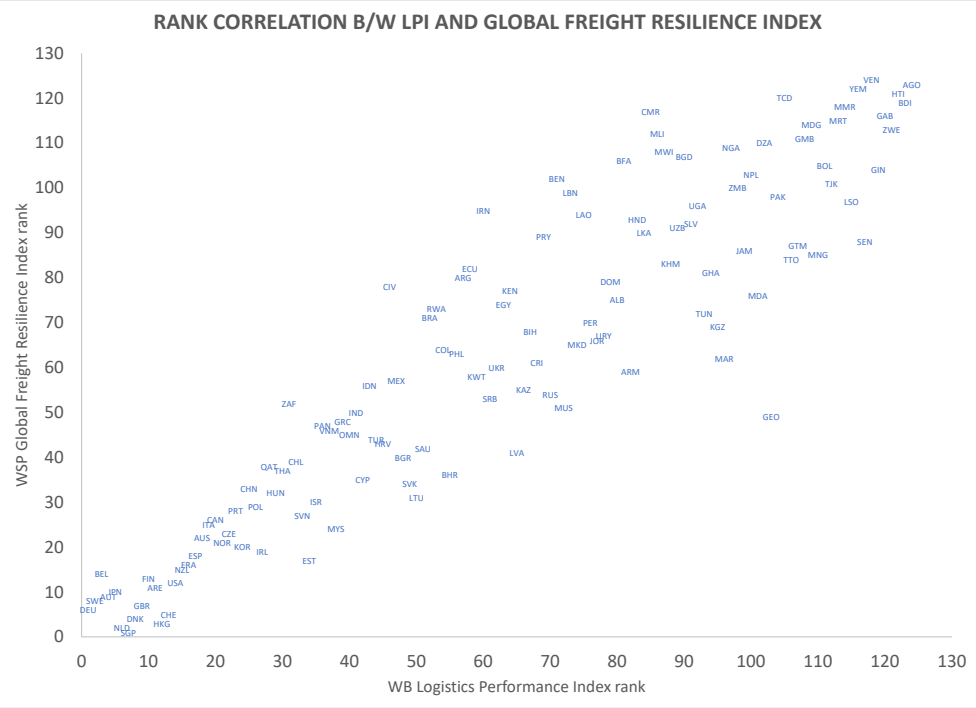
The Index uses the most recent data available from each given source. Of the 35 indicators [20] were taken from sources related to 2019 data.

Data older than 10 years (relative to the most recent year from the source) are not considered. In this case a blank ("n/a") value is assigned.

Robustness/Statistical checks

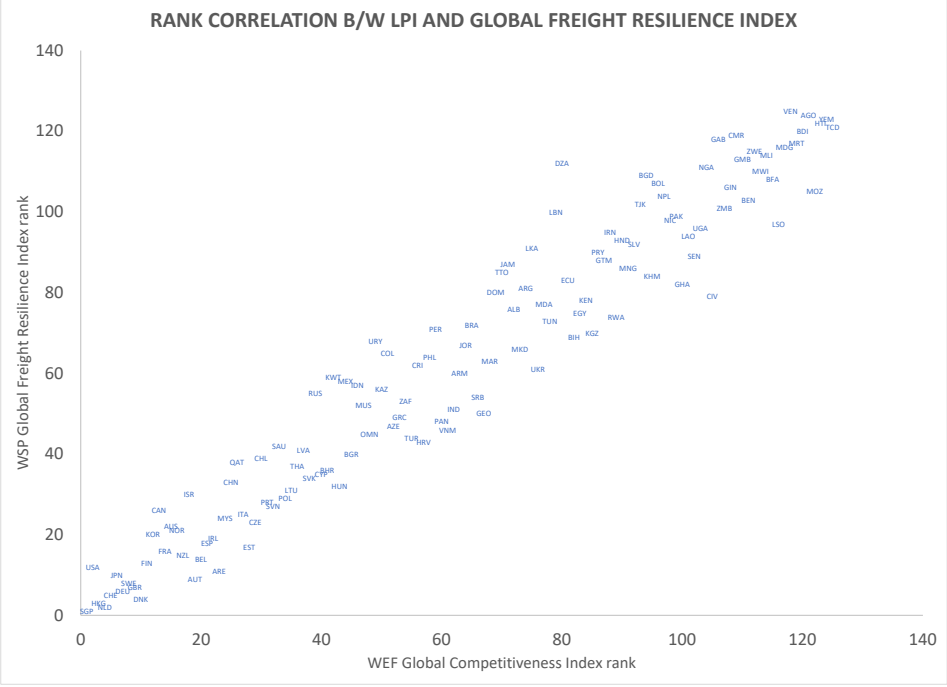
Figure 12 and Figure 13 below show the statistical relationship between the GFRI and the World Bank's Logistics Performance Index, and between the GFRI and the WEF's Global Competitiveness Index.

Figure 12. Comparison with LPI



Source: Whiteshield Partners

Figure 13. Comparison with GCI



Source: Whiteshield Partners

Subindex & time pressure

The Index is comprised of two subindices: (1) Policy Opportunity and (2) Freight Performance. The (absolute) difference in the scores of the two is defined as the "Time Pressure" aspect of freight resilience.

Time Pressure/ Urgency to Act = ABS [(Policy Opportunity) – (Freight Performance)]

It is a measure of the "urgency to act" to take advantage of the freight landscape. It provides a measure of the magnitude of misalignment between a country's policy opportunities and its freight performance indicators. In the 2020 framework, the final Index score was a weighted average of the three parts, with the two subindices worth 40 percent each, and the difference between them accounting for the remaining weight. However, in this edition of the of the GFRI the final Index score is the geometric average of the two subindices. This calculation captures the essence of misalignment between the two subindices as the geometric average is punitive against unequal distributions in the component scores. We still report the difference between the two subindices, however, and note that smaller values are associated with better outcomes.

The top-10 performing countries on each of these aspects of the Index are presented below. Note that Time Pressure is a relative measure and so an economy can perform well on this measure if both subindices are equally underperforming.

Indicators

The Index is comprised of 35 indicators taken from various international organisations. Of the 35 indicators, [25] are "data" indicators, [5] are "opinion" indicators, and [5] are composite indicators. Data indicators are "hard data" variables. That is, they are a measurable quantity indicator. Opinion indicators are sometimes also known as "survey" or "soft" indicators. Composite indicators are indicators that are constructed from other indicators (components). Indicators marked with asterisk (*) are negative indicators (i.e., lower values are associated with better outcomes).

Table 10. Global Freight Resilience Index indicators

Indicators	Description	Scale	Type	Source
1.1.01 Public sector performance	A sub-pillar of the institutions pillar of the WEF Global Competitiveness Report. It is comprised of three indicators: (1) burden of government regulation; (2) efficiency of legal framework in settling disputes; and (3) e-participation index	0-100	Composite	WEF Global Competitiveness Report (2019)
1.1.02 Protection of property rights	Registering property pillar of the World Bank Doing Business Report	0-100	Data	World Bank Doing Business Report
1.2.01 Government orientation	Future orientation of government. A sub-pillar of the institutions pillar of the WEF Global Competitiveness Report	0-100	Composite	WEF Global Competitiveness Report (2019)
1.2.02 Checks & balances	This is a sub-pillar of the institutions pillar from the WEF Global Competitiveness Report	0-100	Composite	WEF Global Competitiveness Report (2019)
1.2.03 Dealing with governance	A composite indicator comprised of: (1) Registering Property indicator from the World Bank Doing Business Report; and (2) Corruption Perceptions Index from Transparency International. Each of	0-100	Composite	Transparency International (2020)

	the underlying components are first normalised and then added before being rescaled again			
2.1.01 GDP growth	Real GDP growth	% (percent change from previous year)	Type: Data	World Bank (2019)
2.1.02 Inflation rate (CPI)**	Rate of inflation measured as year-over-year change in the CPI	% (percent change from previous year)	Data	World Bank
2.1.03 Income per capita	GDP per capita measured in PPP terms	International PPP dollars	Data	World Bank
2.2.01 Credit	Getting Credit pillar of the World Bank Dong Business Index	0-100	Data	World Bank Doing Business Report (2020)
2.2.02 Credit rating	A composite of four credit ratings (S&P, Moody's, Fitch, and DBRS)	Ratings system of each	Data	&P, Moody's, Fitch, and DBRS (aggregated by Trading Economics)
2.3.01 Business environment	Starting a business pillar of the World Bank Doing Business Report	0-100	Composite	World Bank Doing Business Report (2020)
2.3.02 Labour market resilience	The Global Labour Resilience Index final output (a composite indicator) published by Whiteshield Partners (2020)	0-100	Composite	Whiteshield Partners Global Labour Resilience Index (2020)
3.1.01 Mobile phone subscriptions	Mobile cellular subscriptions per 100 persons	Per 100 persons	Data	International Telecommunication Union
3.1.02 Internet use & affordability	Affordability of ICT infrastructure is a composite of three indicators (mobile telephony, and the level of competition in the internet and telephony sectors)	1-7	Composite	Source: WEF Network Readiness Index as reported in the Global Information Technology Report (2016)
3.2.01 Government digitalisation	A composite indicator comprised of: (1) E-Government Index; (2) E-Participation Index; (3) Online Services Index; (4) Human Capital Index; (5) Telecommunications Infrastructure Index	0-1	Composite	UN Government Database (2020)
4.1.01 Export market penetration	Composite indicator of export market penetration using the Herfindahl Index	0-100	Data	World Integrated Trade Solutions
4.1.02 Trade costs*	Estimates of bilateral trade costs in agricultural and manufactured goods	Dollars per unit of trade goods to its trade partners	Data	ESCAP World Bank
4.2.01 Trade openness	A sub-pillar of the product market pillar of the WEF Global Competitiveness Report	0-100	Data	WEF Global Competitiveness Report (2019)
4.2.02 Tariffs*	Trade tariffs	% duty	Data	as reported in the WEF Global Competitiveness Report
4.3.01 Trade	Trade volume as % GDP	% of GDP	Data	World Integrated Trade Solutions
4.3.02 Trade concentration*	The Herfindahl-Hirschman Index of market concentration. This is the	0-1	Data	World Integrated Trade Solutions

	sum of the squares of the trade shares			
5.1.01 Infrastructure quality	Quality of trade- and transport-related infrastructure as measured by a survey opinion of logistics experts	1-5	Opinion	World Bank Logistics Performance Index (2020)
5.1.02 Multimodality	The number of major ports (land, sea, air) per land area	Land area	Data	Air Cargo World, World Shipping, World Ports
5.1.03 Connectedness	DHL Global Connectedness Index	0-100	Composite	DHL Global Connectedness Index (2018)
5.2.01 Maritime connectivity	Liner shipping connectivity index	0-100	Composite	World Bank Development Indicators
5.2.02 Airport connectivity	The airport connectivity indicator of the WEF Global Competitiveness Report	0-100	Data	WEF Global Competitiveness Report (2019)
5.2.03 Land connectivity	Executive opinion survey question from the WEF Global Competitiveness Report	Sc1-7	Opinion	WEF Global Competitiveness Report
6.1.01 Timeliness of shipments	The frequency with which shipments reach consignees within scheduled or expected delivery times	1-5	Data	World Bank
6.1.02 International shipments	The ease of arranging competitively priced shipments	1-5	Data	World Bank Logistics Performance Index (2019)
6.1.03 Tracking & tracing	The ability to track and trace consignments	1-5	Data	World Bank Logistics Performance Index (2019)
6.1.04 Trade compliance	The trading across borders records the time and costs estimates reported by local experts in practice associated with documentary compliance	0-100	Composite	World Bank Doing Business Report 2019
7.1.01 Customs services	Assesses efficiency of customs and border management clearance	1-5	Data	World Bank
7.1.02 Trade across borders	The trading across borders records the time and costs estimates reported by local experts in practice associated with border compliance	0-100	Data	World Bank Doing Business Report 2020
7.1.03 Clearance	Assesses the effectiveness and efficiency of the clearance process by customs and other border control agencies in the eight major trading partners of each country.	0-100	Data	WEF Global Competitiveness Report 2019

Source: Whiteshield Partners

FOR MORE INFORMATION

For more information about the GFRI or other reports and thought leadership from Whiteshield Partners visit https://www.whiteshieldpartners.com/insights/GFRI_2021_report