Pandemic-Resilient Cities Ranking 2022

DEEP KNOWLEDGE ANALYTICS

Benchmarking of Municipal Pandemic Response

- Vaccines
- Economy
- Prevention
- Governance
- Safety
- Compliance

July 2022

Pandemic-Resilient Cities Ranking 2022:

Benchmarking of Municipal Pandemic Response (Vaccines, Economy, Prevention, Governance, Safety, Compliance)

Deep Knowledge Analytics
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Pandemic-Resilient Cities Ranking 2022: Benchmarking of Municipal Pandemic Response - Vaccines, Economy, Prevention, Governance, Safety, Compliance

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EXECUTIVE SUMMARY

As major global economies slowly reopen and the world is now learning to 'live' with the virus, public health experts tend to stress that pandemic is not over. Humanity has already learned the hard way of the virus emerging with new variants, with each new strain being more contagious, yet, thankfully, less lethal. The emergence of the omicron variant proved far more infectious but less deadly. It eventually created a sharp peak and fall of cases across the countries and demonstrated different levels of tolerance of leaders to co-exist with COVID-19. Certainly, the long lasting impact on mental and physical health of people is yet to be fully understood, whether it is lingering symptoms or 'long COVID' ones.

Global leaders are now faced with the choice: to sustain new capacities and channel focus and resources generated by COVID-19 to improve gaps in preparedness for the long term or to neglect them and leave the world at risk of further inevitable health threats. City governments and local community organisations are at the forefront of curtailing the pandemic and key actors of the effective response. Throughout the first year and a half of the COVID-19 pandemic, cities rebuilt not only their healthcare but also their economy and adapted to the pandemic realities at a managerial level. From mid-2021 to spring 2022, contextual factors such as quality of leadership and trust in government have impacted the extent of success of policy-making across the globe. The pandemic has demonstrated new, more pressing demands for the digital government services to procure assistance and solutions to cope with the plague in a timely manner.

The level of stringency of lockdown measures implemented by the national, local, and regional authorities to control the virus spread had a serious impact on mobility patterns for shopping, business, and leisure activities. Almost all countries have implemented fiscal support programmes since COVID-19 hit, with significant diversity in composition and volume of these fiscal stimulation programmes. The emphasis here is on vulnerable groups as the distributional outcomes of the pandemic have been uneven: The plague substantially increased inequality gaps with negative consequences for people in vulnerable conditions and their economic, social, and physical well-being.

Humanity has never been at more crucial moment with regards to our health and well-being. Another winter of COVID-19 is coming, but what does the future hold? Having faced the staggering losses from COVID-19, global and national leaders are now obliged to enhance new resilience capacities, serving their people beyond the current pandemic. As COVID-19 still spreads, stressing health systems, creating disruption, and exhausting government budgets and social protection, it certainly is not the last global health emergency the world is facing. Climate change, biotechnological advances, urbanisation, and threats from deliberately engineered bioweapons will increase the risk of future, more frequent pandemics.

The scientific community is constantly striving to shed light on various issues related to the factors that affect the effectiveness of anti-epidemic measures. This publication is the tenth research on COVID-19 and the second iteration of an ongoing and periodically updated series of municipal COVID-19 analytics reports by Deep Knowledge Analytics.

EXECUTIVE SUMMARY

About Pandemic-Resilient Cities Ranking

This publication is a second iteration of an ongoing and annually updated series of reports dedicated to municipal COVID-19 analytics. The previous iteration examined regional responses at the city level in terms of their level of preparedness to achieve inclusion and resilience, speed of the response to the pandemic, and overview of economic and social policy from 2020 to mid-2021. The analysis used over 8,000 data points, 114 indicators, qualitative or quantitative in nature, classified into five qualitatively distinct categories applied to 72 cities and municipalities globally.

The primary focus of the second iteration of the report **is to analyse the progress** of regional response to pandemics at the city level. Advancement of policies implemented to tackle the threat from both successful examples of municipalities and those lagging behind will be compared. The current analysis was expanded. It uses over 14,000 data points, applying the analytical framework composed of 141 qualitative and quantitative indicators, classified into six distinct categories, applied to 100 cities globally. From these 100 cities, the top 50 with the highest scores were selected and analysed for their best practices and the challenges they had to face.

The study includes a detailed analysis of trends in government efficiency, economic resilience, and healthcare management. The new, 'Cultural Compliance' category of parameters was added to provide insights on distinct trajectories, shaped by the institutional arrangements, national cultural orientations, and response of the population.

The analysis is based on the data collected from September 2021 till mid-June 2022. The ranking examines several contextual factors to ensure the economy is stabilised during emergencies and effectively manages internal health system resources. It also provides insights on lessons learned related to urban design, collaborative governance, public behaviour, and efficiency of nonpharmaceutical interventions. Based on the analysis, further public policy recommendations are developed to assist municipalities and countries to strengthen their response to the future threats and help recover their economies.

Comparison of 2021-2022 COVID-19 Analytics

By regularly releasing an assessment of national and municipal responses to the constant changes created by the COVID-19 crisis, the Pandemic-Resilient Cities Ranking aims to evaluate continued progress and generate additional policy recommendations to fill identified gaps. Since the release of the 2021 ranking, and by the middle of the 2022 ranking research period, an additional 28 cities have been examined and added to the overall ranking, and 72 cities remained the same. Among those analysed previously, some municipalities, such as Ottawa, Tokyo, Auckland, Madrid, Oslo, made advances through the policies they have implemented and have shown an increase in their overall scores. Others, such as London, Berlin, Tel Aviv-Yafo, and Hong Kong, have shown a decrease in their score.

The table below compares the cities from the previous iteration and their progress in developing a COVID-19 containment policy during mid-2021 and mid-2022.

Rank 2022	City	Score 2022	Score Change 2021-2022	Rank Change 2021-2022
3	Ottawa	66.84	▲ 2.26	▲ 7
4	Seoul	65.96	▼ -5.45	▼ -1
5	Tokyo	65.55	▲ 2.46	▲ 9
10	Sydney	64.25	▼ -0.99	▼ -3
12	Auckland	64.15	▲ 2.68	▲ 7
15	Oslo	62.91	▲ 4.29	▲ 13
16	London	61.89	▼ -2.25	▼ -5
17	Berlin	61.64	▼ -1.67	▼ -4
18	Dublin	61.52	▼ -3.23	▼ -9
22	Riyadh	60.31	▲ 2.84	▲ 9
23	Dubai	60.07	▼ -6.95	▼ -18
24	Copenhagen	59.21	▼ -3.72	▼ -9
25	Bern	58.57	▼ -1.41	▼ -2
26	Madrid	58.56	▲ 1.22	▲ 6
29	Helsinki	58.17	▼ -2.09	▼ -8
30	Tel Aviv-Yafo	57.81	▼ -9.47	▼ -26
31	Brussels	57.58	▼ -3.05	▼ -11
32	Doha	57.55	▲ 1.73	▲ 4
36	Vienna	55.49	▼ -0.96	▼ -3
37	Lisbon	54.15	▲ 3.78	▲ 13
38	Hong Kong	53.76	▼ -5.69	▼ -14
40	Hanoi	53.15	▲ 1.47	▲ 4
41	Budapest	52.41	▼ -3.79	▼ -6
42	Athens	51.92	▲ 0.34	▲ 4
43	Valletta	51.76	▼ -4.61	▼ -9
44	Prague	51.72	▼ -2.03	▼ -5

Economic Resilience

Capacity to resist global economic crisis and recover rapidly to the previous level of growth or higher

Recover

Resilient Capacity in Times of Crisis;
Economic Impact of Reduction in Tourism;
Economy Rescue Package;
Economy Vitality;
Market Attractiveness;
Wealth Indicator.

Healthcare Management

The resilience of the health system during the pandemic.

Manage

E-Health Score;
Health System Resources;
Healthcare COVID Response;
Population Vulnerability;
Public Health.

Vaccination Rate

The distribution rate of safe and effective vaccines against COVID-19 among the population.

Treat

Affordability of COVID-19 Vaccines;
Deployment of COVID-19 Vaccines;
Efficiency of Vaccine Allocation;
Vaccine Production Capacity.

Government Efficiency

Rapid and sufficient response to COVID-19 spread by the government

Act

E-Readiness;
Emergency Response Mechanism;
Public Involvement;
Satisfaction With Government Performance;
Surveillance Practices.

Quarantine Efficiency

The effectiveness of the measures taken by the authority in order to cope with the COVID-19 spread.

Control

COVID-19 Detection;
City Preparedness for Pandemics;
Stringency of Containment Policy;
Post-COVID Strategy;
Prevention of COVID-19 Spread.

Cultural Compliance

Classification of cultural factors that shape the degree of health-protective behaviour and compliance of citizens during the COVID-19 pandemic.

Comply

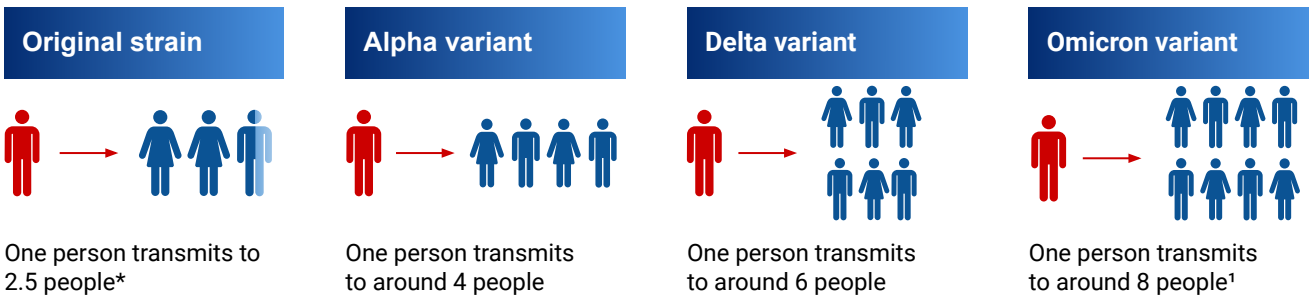
Acceptance of Hierarchy;
Degree of Social Interdependence;
Risk Objection and Uncertainty Avoidance;
Importance of Personal Freedom;
Level of Prosperity and Life Opportunities;
Strength of Social Norms.

COVID-19: 2021 IN REVIEW

Since the beginning of pandemic, we've observed a number of prominent variants of coronavirus, including alpha, beta, delta, and omicron. Omicron, the newest variant, was also the quickest to be labeled as a 'variant of concern' by WHO.

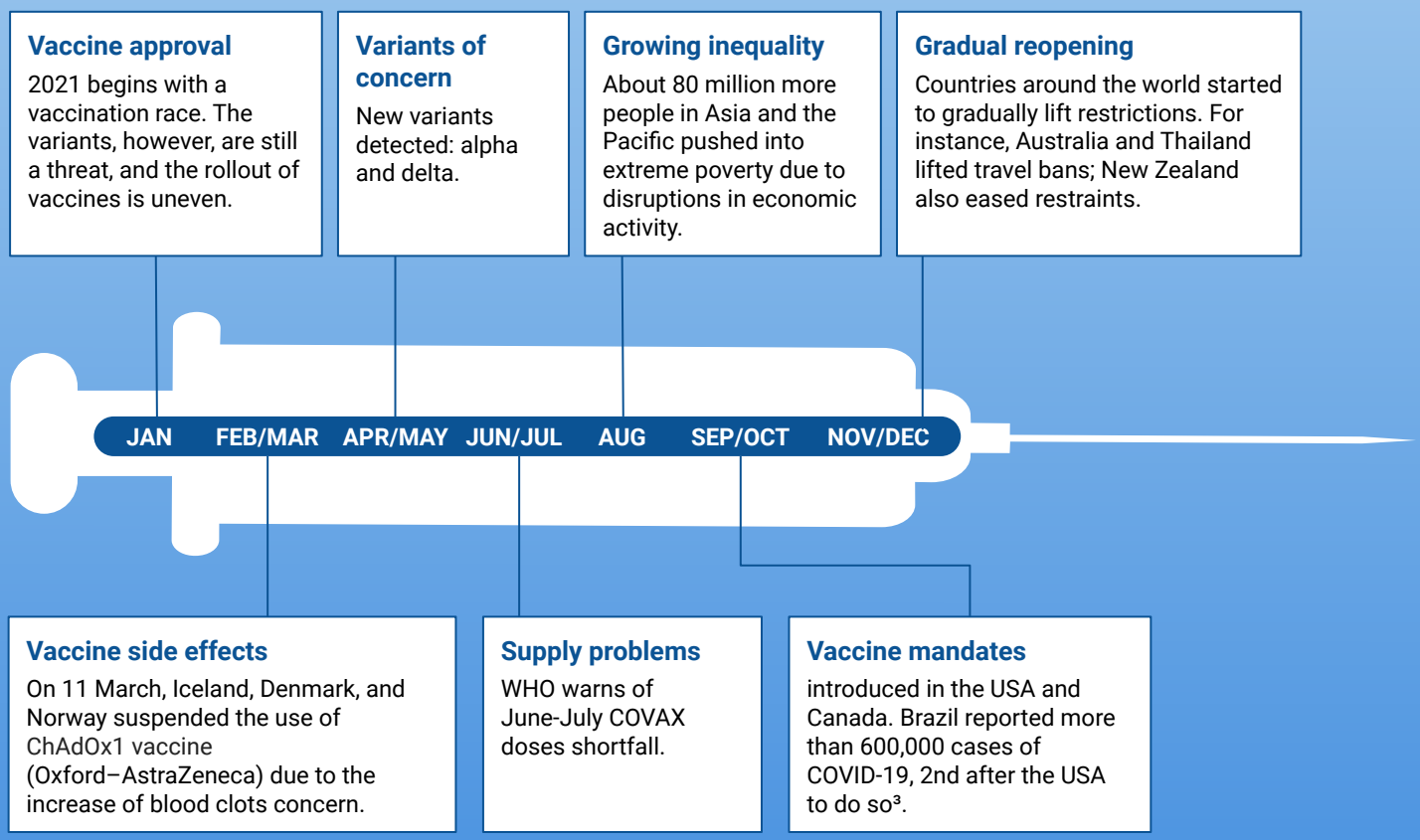
Throughout 2021, delta variant has been more contagious.

Figure 1: Estimated number of people who contract the virus from one infected person in population without vaccines, lockdowns, or other precautions.



Source: Center for Disease Control and Prevention, Council on Foreign Relations[2].

The COVID-19 pandemic continued to rage in 2021, but it was increasingly an unequal pandemic, with rich countries receiving millions of doses of vaccine and ending lockdowns and travel bans. It was also a year when policymakers started to prepare for the next inevitable pandemic.



COVID-19: 2021 IN REVIEW
KEY INSIGHTS

POLICY CONTEXT

Since mobilisation of resources across all policy domains and involvement of wide range of actors were a part of government response to the pandemic, cooperation among government institutions and agencies has been fundamental to ensure efficient and coherent response in 2021.

Box 1. Good Practices in Australia, Ireland, and South Korea

The Department of Industry, Science, Energy and Resources and the Department of Health in Australia collaborated to operate the increase in the national medical stockpile. The flexible taskforce approach was implemented by the departments to manage procurement and engage leadership staff in decision-making. The process for managing conflicts of interests in both departments was established, which was considered fit-for-purpose by the Australian National Audit Office.[4]

Respectively, Ireland created a Medicines Criticality Assessment Group (MCAG) that applied a multistakeholder approach, which engaged the Department of Health, the Health Service Executive, pharmacists, clinicians, the Regulatory Authority of Health Products, and private bodies to prevent potential medicine shortage. This step allowed the country to increase capacity and oversight of supply and demand of medicines and discern alternative medicinal products.[5]

In South Korea, rapid activation, reorganisation, and consolidation of a network of public health agencies dedicated to respond to emergency, played a critical role in tackling the COVID-19 pandemic. Hence, originally placed under the supervision of the Ministry of Health and Welfare, the Korean Centers for Disease Control were upraised to the Korea Disease Control and Prevention Agency (KDCA). This newly promoted agency obtained vice-ministerial rank and functioned as a disease 'control tower', overlooking regional and national efforts to combat COVID-19.[5]

POLICY CONTEXT

Effective communications during crisis is key in delivering relevant public health messages to prevent/control infection and inform citizens on how to comply with lockdowns and other requirements. Crisis communication has been identified as the most challenging communication competency due to coordination related issues and human resources.[4]

Box 2. Communication Practices in Switzerland and Canada

The Swiss government used various communication channels to update citizens about current situation and control measures. Besides frequent press conferences by the Federal Council and experts, poster campaigns, social media, and the 'Alertswiss' app were employed to disseminate information. During the highest emergency level, the Council gave three press conferences each week, supplemented by press briefings with specialists every second week.[4]

On the contrary, Canadian experience shows that guiding principles, which increase the effectiveness of crisis communication and demonstrate trustworthiness (clarity, transparency, compassion and empathy, and timeliness) were not consistently found in official posts on social media and public channels (CTV News, CBC News, Healthy Canadians Facebook page). The study on the topic connects the negative sentiment in the comments from the public related to the lack of guiding principles throughout communication with the public.[6]

COVID-19: 2021 IN REVIEW
KEY INSIGHTS

POLICY CONTEXT

Countries quickly closed their borders and imposed travel restrictions, but they encountered issues with coherence and compliance when it came to lockdown measures.

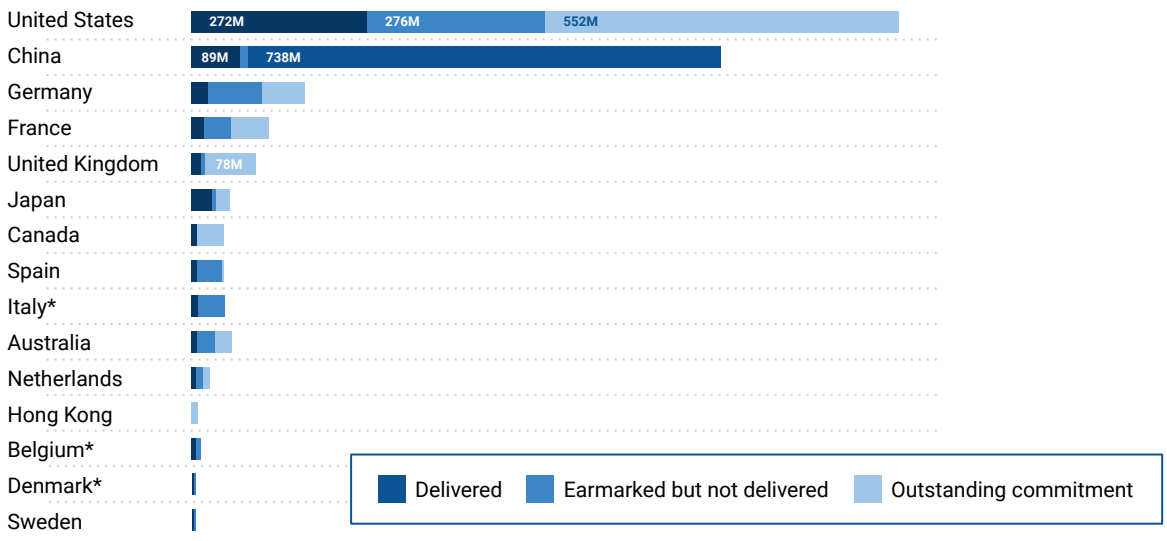
Box 3. Compliance With Lockdowns in Peru and UAE

Peru, a Latin American country that suffered one of the worst pandemic outbreaks in the world, struggled to contain the spread of the virus despite the strict measures of quarantine adopted by the government early on. The policy, however, did not consider problems with overcrowded housing in the country as well as socioeconomic status of the population. Economically vulnerable individuals were less likely to comply with the measures due to the large shadow economy. Support measures included four cash transfer programs: Bono Rural, Bono Indepediente, Bono Universal Familliar, and Bono Yo Me Quedo en Casa. While such transfers targeted informal and self-employed workers, the databases used were incomplete and outdated.[7]

On the contrary, UAE has adopted the mitigation strategy based on sterner restrictions and complete lockdown, followed by the control strategy that progressively lifted restrictions. Proactive stringent measures included fines for quarantine violations, prohibitions on public gatherings, breach of face mask usage and operational regulations. Although there have been cases of citizens violating the rules, the UAE population has demonstrated a high degree of voluntary compliance and cooperation with the government. Vulnerable groups have also been supported: Several UAE government and nongovernment organisations supported low-income households through the '10 million meals' campaign, aimed at helping those severely financially impacted by the pandemic.[8]

GLOBAL POLICY CONTEXT:

After developed nations have made considerable progress in immunising their populations during the first half of 2021, promises of donations to poorer countries ramped up. As of November 2021, countries committed to donate 2.74 billion doses combined; however, fewer than half of pledged doses had been delivered[9].



*Belgium has already delivered more doses (8.1 million) than it pledged to donate by the end of 2021 (7.3 million) and has earmarked an additional 5.6 million doses to be donated to specific countries. Similarly, Denmark and Italy have delivered or earmarked more doses than their initial donation commitments (6.8 million vs. 6 million by Denmark and 49.5 million vs. 45 million by Italy)

Source: Think Global Health.org

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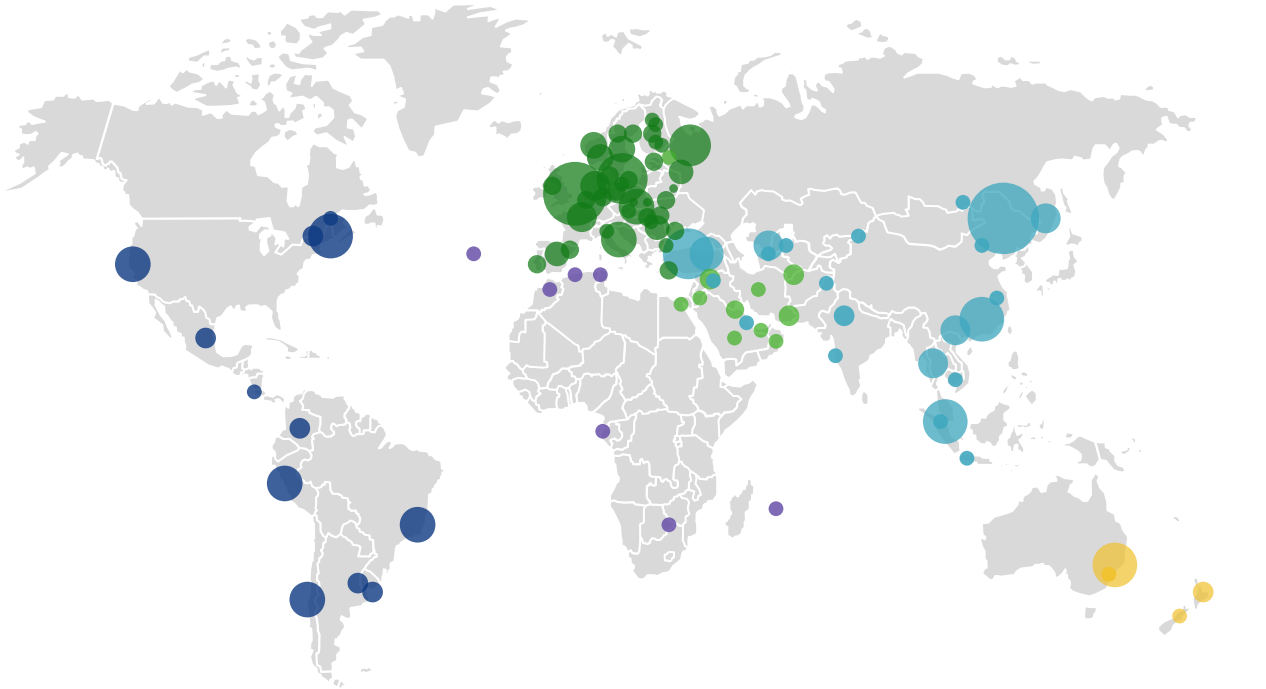
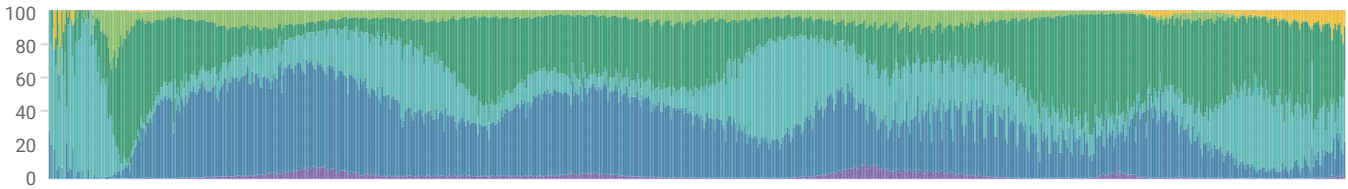
COVID-19 WORLDWIDE 2022

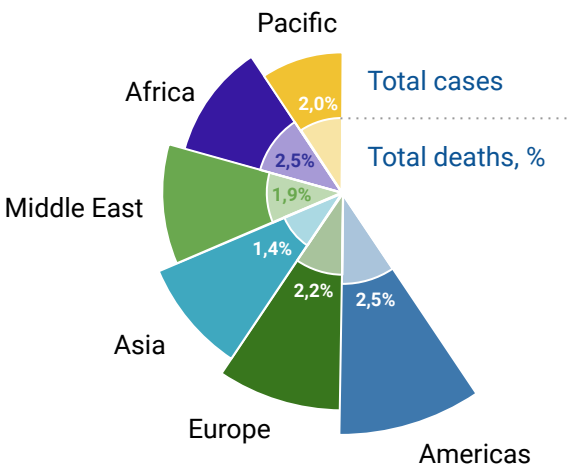
60,3%	65,7%	523M
of global population is fully vaccinated	of the world population has received at least one vaccine dose	total cases worldwide



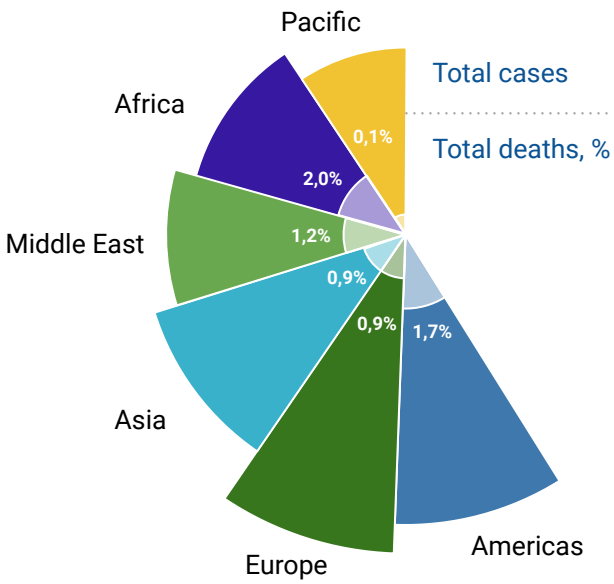
Share of COVID-19 Cases by the Region From the Beginning of the Pandemic



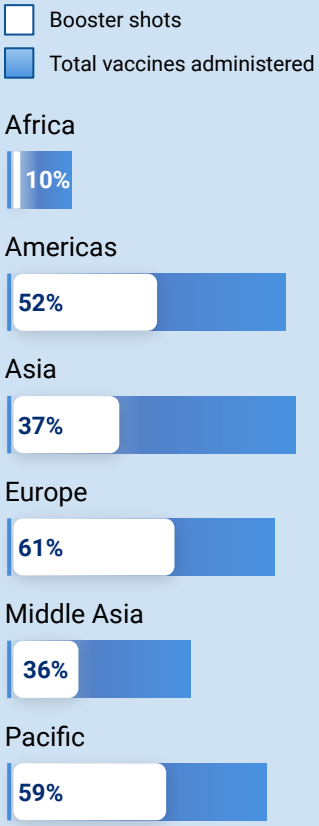
March 2020 - March 2021



April 2021 - April 2022

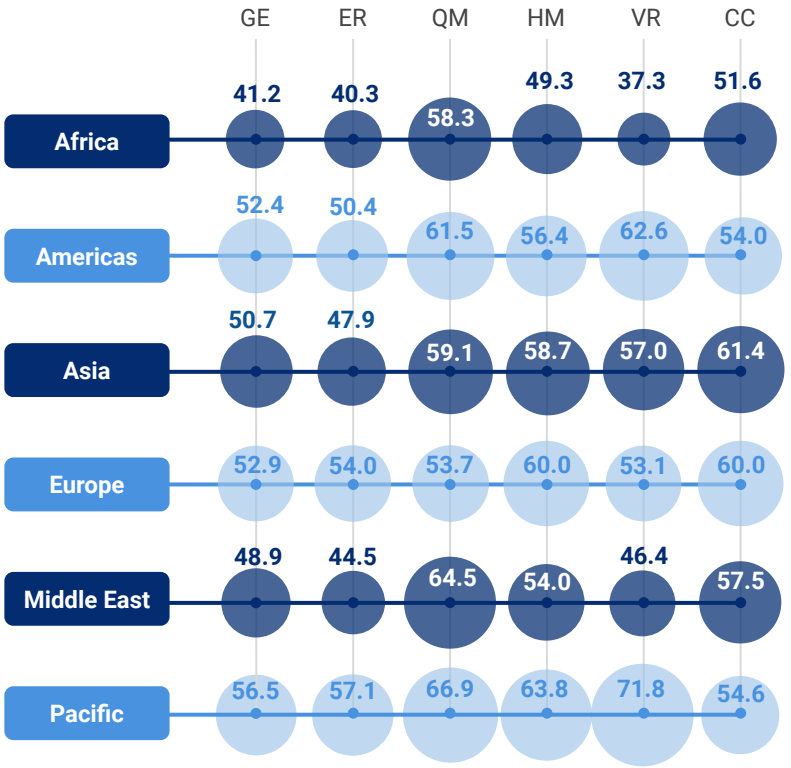


Vaccination Rate by Region



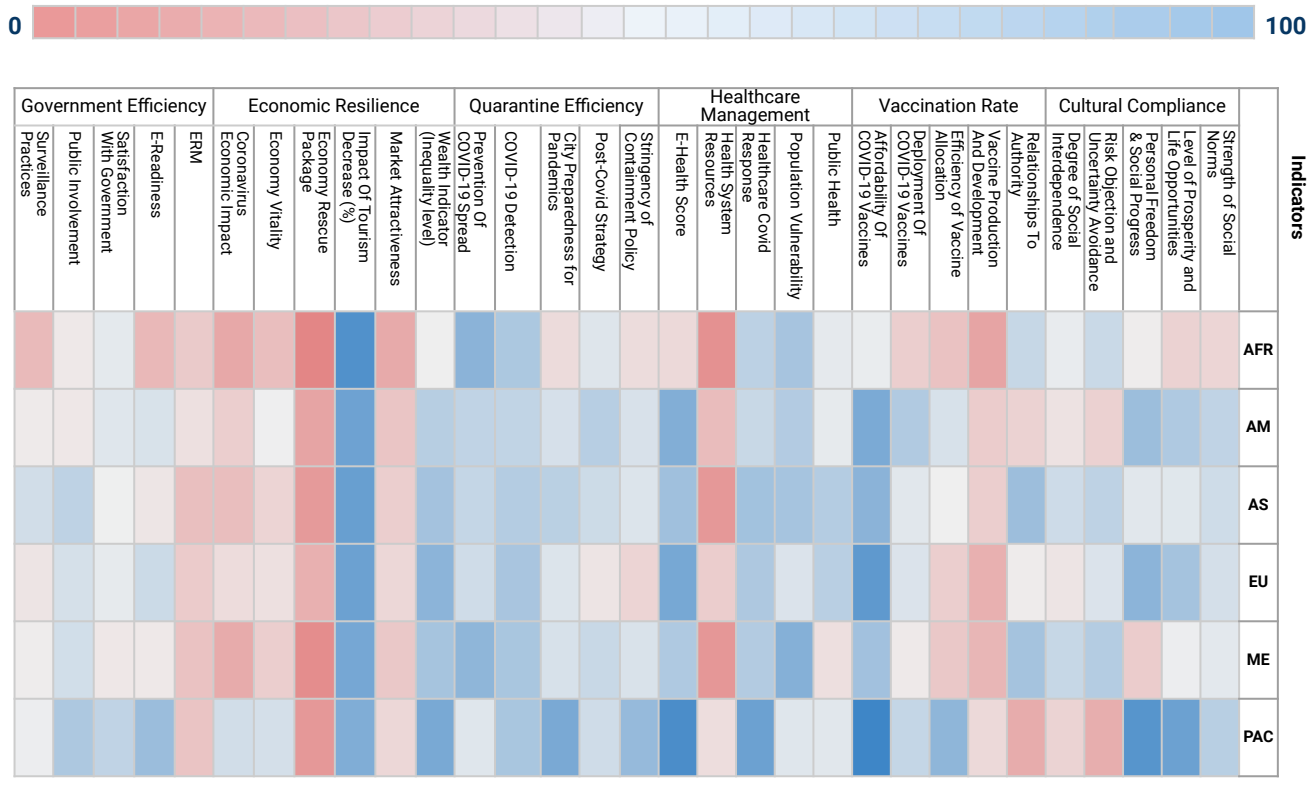
Category Scores on Regional Level

Parameters from each municipal pandemic response functions (categories) are grouped by region, with average value displayed.

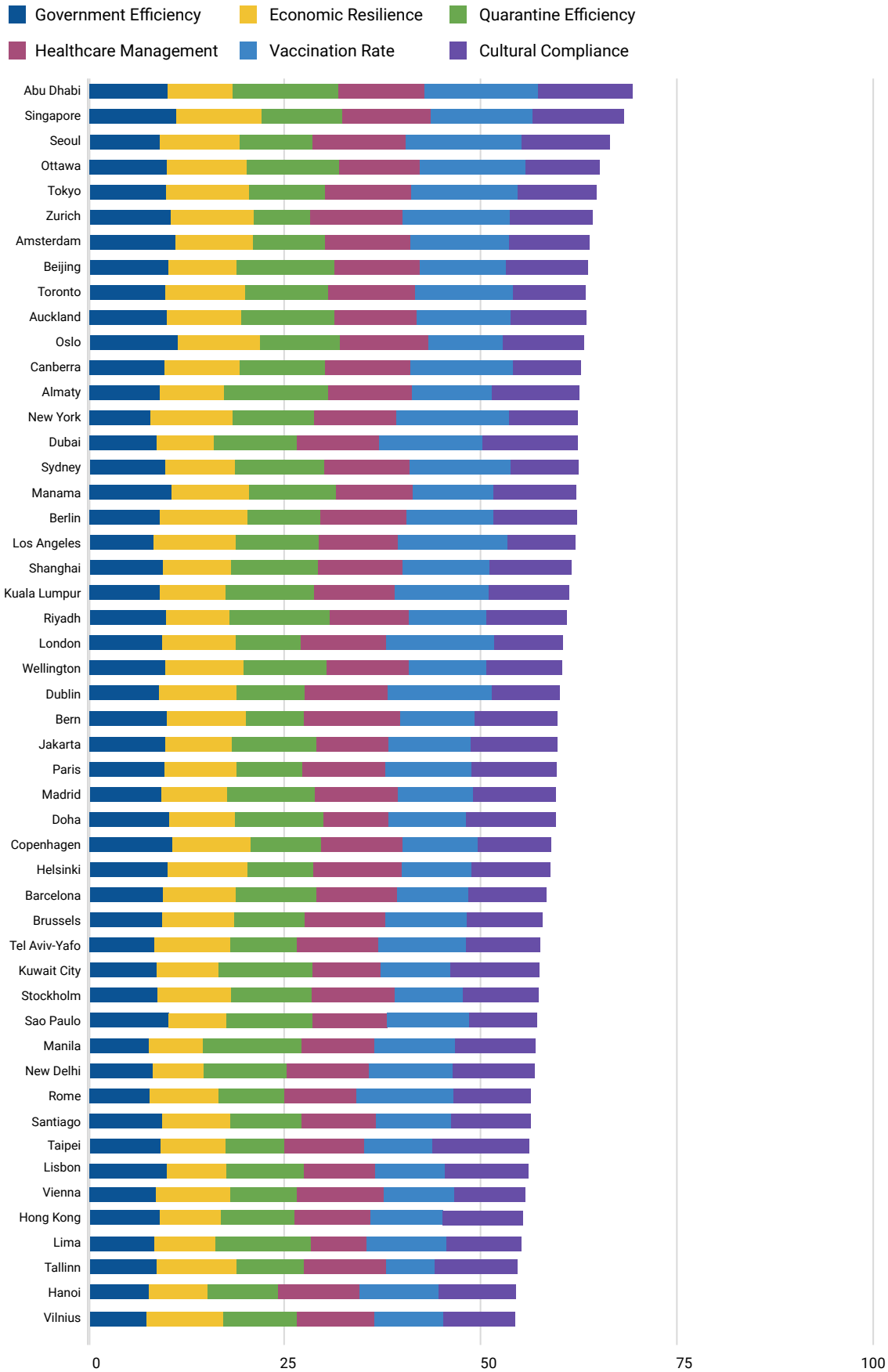


Containment Policy Evaluation by Region

Using the same principle, parameters from each category are grouped by region, with average score displayed for each distinct category. The score represents the relative efficiency of the municipal actions where 0 (red color) indicates unfavourable response and actions lead to zero efficiency while 100 (blue color) represents a perfect response as measured by the Pandemic-Resilient Cities Ranking criteria.

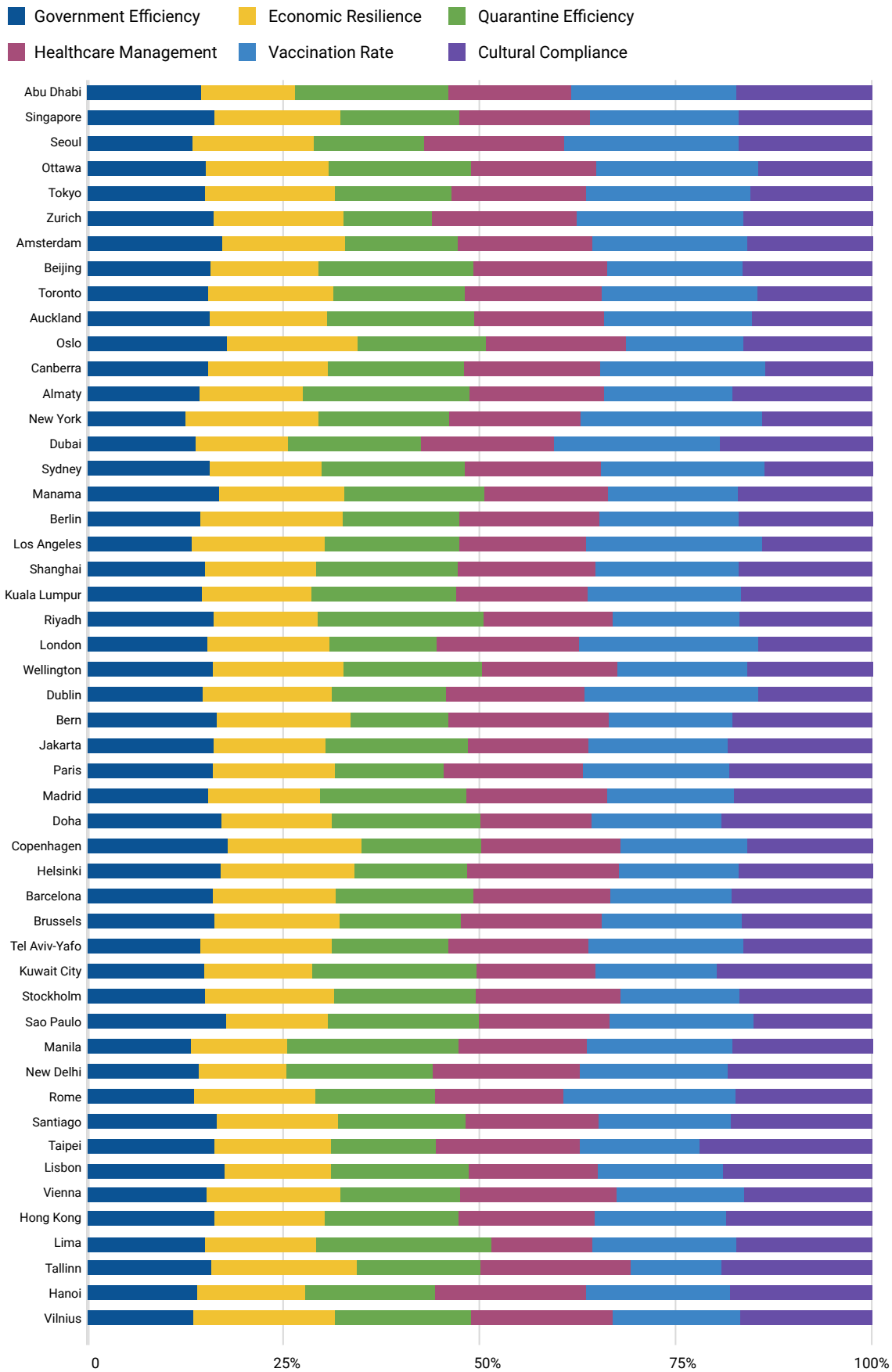


COVID-19 MUNICIPAL PANDEMIC RESPONSE: COMPREHENSIVE RANKING 2022*



*The figure displays Top 50 Cities of the Ranking, where the final score for each city is the sum of six equally weighted categories and ranges from 0 to 100.

COVID-19 MUNICIPAL PANDEMIC RESPONSE: COMPREHENSIVE RANKING 2022*



*This is the stacked version of the barchart, which displays the share of each category in the overall score.

RANKING BY CATEGORY OF TOP 50 CITIES

TABLE 1A: Government Efficiency

Rank	City	Government Efficiency
1	Oslo	67.16
2	Singapore	66.16
3	Amsterdam	65.75
4	Copenhagen	62.68
5	Manama	62.34
6	Zurich	61.75
7	Doha	60.49
8	Sao Paulo	60.22
9	Abu Dhabi	59.87
10	Helsinki	59.67
11	Beijing	59.67
12	Bern	58.95
13	Lisbon	58.86
14	Ottawa	58.82
15	Auckland	58.81
16	Riyadh	58.27
17	Tokyo	58.13
18	Sydney	57.91
19	Toronto	57.86
20	Wellington	57.60
21	Canberra	57.44
22	Jakarta	57.31
23	Paris	57.14
24	Barcelona	56.25
25	Shanghai	55.74
26	Brussels	55.63
27	Santiago	55.11
28	London	55.01
29	Madrid	54.92
30	Taipei	54.30
31	Kuala Lumpur	53.57
32	Hong Kong	53.38
33	Berlin	53.37
34	Almaty	53.35
35	Seoul	53.20
36	Dublin	52.69
37	Tallinn	51.31
38	Stockholm	51.20
39	Dubai	51.05
40	Kuwait City	50.87
41	Vienna	50.76
42	Tel Aviv-Yafo	49.82
43	Lima	49.21
44	Los Angeles	48.86
45	New Delhi	48.17
46	New York	46.31
47	Rome	45.55
48	Hanoi	45.30
49	Manila	45.02
50	Vilnius	43.56

TABLE 1B: Economic Resilience

Rank	City	Economic Resilience
1	Berlin	67.49
2	Singapore	65.57
3	Zurich	63.87
4	Tokyo	63.85
5	New York	63.67
6	Los Angeles	63.26
7	Oslo	62.39
8	Ottawa	61.11
9	Seoul	60.98
10	Tallinn	60.79
11	Bern	60.77
12	Toronto	60.47
13	Helsinki	60.37
14	Copenhagen	60.21
15	Amsterdam	59.90
16	Wellington	59.77
17	Manama	59.48
18	Dublin	59.08
19	Vilnius	58.93
20	Tel Aviv-Yafo	57.57
21	Canberra	57.04
22	Auckland	56.98
23	Vienna	56.89
24	Stockholm	56.50
25	London	56.25
26	Barcelona	55.31
27	Paris	55.28
28	Brussels	54.96
29	Sydney	53.32
30	Shanghai	52.43
31	Rome	52.36
32	Beijing	52.22
33	Santiago	51.86
34	Jakarta	51.03
35	Madrid	50.78
36	Kuala Lumpur	50.64
37	Doha	50.10
38	Abu Dhabi	49.57
39	Almaty	49.44
40	Taipei	49.40
41	Riyadh	48.21
42	Kuwait City	47.31
43	Lima	46.65
44	Hong Kong	46.60
45	Lisbon	45.16
46	Hanoi	44.62
47	Sao Paulo	44.18
48	Dubai	44.08
49	Manila	41.70
50	New Delhi	38.23

TABLE 1C: Quarantine Efficiency

Rank	City	Quarantine Efficiency
1	Abu Dhabi	80.37
2	Almaty	79.55
3	Riyadh	76.42
4	Manila	75.11
5	Beijing	74.79
6	Lima	73.73
7	Kuwait City	71.85
8	Auckland	70.82
9	Ottawa	70.59
10	Sydney	67.74
11	Kuala Lumpur	67.49
12	Doha	67.32
13	Manama	66.39
14	Shanghai	66.34
15	Madrid	66.33
16	Sao Paulo	65.48
17	Canberra	65.28
18	Jakarta	64.87
19	Wellington	63.84
20	Los Angeles	63.82
21	New Delhi	63.39
22	Toronto	63.20
23	Dubai	63.07
24	New York	62.22
25	Barcelona	61.86
26	Singapore	61.66
27	Stockholm	61.65
28	Oslo	61.49
29	Lisbon	59.07
30	Tokyo	57.49
31	Hong Kong	56.41
32	Vilnius	56.06
33	Seoul	55.67
34	Berlin	55.23
35	Amsterdam	54.77
36	Santiago	54.65
37	Hanoi	54.48
38	Copenhagen	53.89
39	Brussels	53.39
40	Dublin	52.39
41	Tallinn	52.10
42	Rome	51.26
43	Tel Aviv-Yafo	51.19
44	Vienna	50.87
45	Helsinki	50.74
46	Paris	50.08
47	London	49.30
48	Taipei	44.86
49	Bern	44.38
50	Zurich	43.12

RANKING BY CATEGORY OF TOP 50 CITIES

TABLE 1D: Healthcare Management

Rank	City	Healthcare Management
1	Bern	73.54
2	Seoul	71.27
3	Zurich	70.47
4	Helsinki	67.90
5	Singapore	67.65
6	Oslo	67.52
7	Tokyo	66.40
8	Toronto	66.26
9	Vienna	66.19
10	Berlin	66.08
11	Beijing	65.93
12	London	65.54
13	Amsterdam	65.47
14	Abu Dhabi	65.39
15	Canberra	65.14
16	Sydney	64.92
17	Shanghai	64.69
18	Madrid	63.97
19	Almaty	63.85
20	Stockholm	63.42
21	Paris	63.30
22	Dublin	63.23
23	Dubai	63.22
24	New Delhi	63.02
25	Auckland	62.71
26	Copenhagen	62.62
27	Tallinn	62.48
28	New York	62.40
29	Wellington	62.38
30	Tel Aviv-Yafo	62.15
31	Ottawa	62.08
32	Brussels	61.97
33	Hanoi	61.82
34	Kuala Lumpur	61.56
35	Taipei	61.49
36	Barcelona	61.42
37	Riyadh	60.79
38	Los Angeles	59.98
39	Vilnius	59.11
40	Manama	58.83
41	Hong Kong	57.44
42	Sao Paulo	57.10
43	Santiago	57.09
44	Manila	55.64
45	Rome	55.50
46	Jakarta	54.91
47	Lisbon	54.69
48	Kuwait City	52.26
49	Doha	50.23
50	Lima	42.49

TABLE 1E: Vaccination Rate

Rank	City	Vaccination Rate
1	Seoul	88.32
2	Abu Dhabi	87.21
3	New York	86.18
4	Los Angeles	83.44
5	London	82.96
6	Zurich	81.78
7	Tokyo	81.28
8	Ottawa	80.74
9	Dublin	79.59
10	Dubai	79.08
11	Canberra	78.67
12	Sydney	77.34
13	Singapore	77.24
14	Amsterdam	75.30
15	Toronto	75.18
16	Rome	73.87
17	Kuala Lumpur	71.76
18	Auckland	71.30
19	Tel Aviv-Yafo	68.23
20	Paris	66.17
21	Shanghai	66.13
22	Berlin	65.99
23	Beijing	65.62
24	New Delhi	64.62
25	Jakarta	63.60
26	Sao Paulo	62.76
27	Manila	62.54
28	Brussels	62.27
29	Manama	61.38
30	Almaty	61.35
31	Lima	60.87
32	Hanoi	60.48
33	Wellington	59.83
34	Doha	59.16
35	Riyadh	58.61
36	Madrid	57.78
37	Copenhagen	57.04
38	Santiago	56.85
39	Oslo	56.80
40	Bern	56.71
41	Hong Kong	55.63
42	Barcelona	54.13
43	Vienna	53.82
44	Lisbon	53.49
45	Kuwait City	53.29
46	Helsinki	53.29
47	Vilnius	53.17
48	Stockholm	52.30
49	Taipei	51.41
50	Tallinn	37.30

TABLE 1F: Cultural Compliance

Rank	City	Cultural Compliance
1	Taipei	73.84
2	Dubai	72.63
3	Abu Dhabi	71.71
4	Singapore	69.41
5	Doha	68.15
6	Kuwait City	67.82
7	Seoul	67.22
8	Almaty	66.35
9	Jakarta	65.87
10	Paris	64.89
11	Berlin	63.73
12	Lisbon	63.66
13	Zurich	63.51
14	Bern	63.51
15	Manama	63.49
16	Tallinn	62.94
17	Madrid	62.71
18	Barcelona	62.71
19	New Delhi	62.57
20	Shanghai	62.52
21	Beijing	62.52
22	Oslo	61.75
23	Riyadh	61.51
24	Hong Kong	61.49
25	Amsterdam	61.23
26	Manila	60.97
27	Kuala Lumpur	60.90
28	Santiago	60.53
29	Helsinki	60.36
30	Tokyo	60.35
31	Hanoi	59.00
32	Rome	58.58
33	Stockholm	57.93
34	Auckland	57.66
35	Wellington	57.66
36	Brussels	57.36
37	Lima	57.17
38	Tel Aviv-Yafo	56.41
39	Ottawa	56.31
40	Copenhagen	56.27
41	Toronto	55.45
42	Vilnius	54.70
43	Vienna	54.21
44	New York	52.40
45	London	52.39
46	Dublin	52.13
47	Los Angeles	52.12
48	Sao Paulo	51.67
49	Canberra	51.56
50	Sydney	51.54

Pandemic-Resilient Cities Ranking 2022:

An Overview of COVID-19 Interventions and Preparedness

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GENERAL CONCLUSIONS

There are six key areas that city governments should focus on in order to prevent the spread of COVID-19 and to stay resilient to and prepared for events of similar biological threats: government efficiency, economy stability (resilience), healthcare management, quarantine measures efficiency, vaccination strategy, and cultural compliance.

This chapter summarises the major findings for each category of the Pandemic-Resilient Cities Ranking conducted, including specific examples of cities that have successfully applied some practice or vice versa – municipalities that should consider the finding as a recommendation. The overall summary is presented in the table on **pages 44-49,** outlining major issues that occurred due to the pandemic and recommendations for post-COVID planning as identified by the study.

The average total score among 100 cities is 55 out of a possible score of 100 while the maximum and minimum total scores are 69.5 and 35.5, respectively.

Government Efficiency

The course of pandemic has shown that besides quality of coordination among government levels, other factors such as quality of leadership, legitimacy, credibility, and trust in government have shown to improve or worsen the outcome of coordination efforts. It has been observed that regardless of development level and quality of governance, large countries have had a harder time to contain the virus than smaller countries. For instance, Brazil, India, South Africa, or the USA put much more effort in battling the virus spread than Georgia, New Zealand, or Slovakia.[4]

Hereby, the pandemic has demonstrated new, more pressing demands for the digital government services to procure assistance and solutions to cope with the plague in a timely manner. The issue of access equity also received considerable attention. Governments across the world would often launch contact tracing applications, which neglected citizens without access to mobile internet or smartphones. Thus, factors of inclusion and accessibility into data solutions should be emphasised in policymaking as well as possible options for digital contract tracing for countries that do not have relevant infrastructure.

The study also shows that effective government depends on public trust by encouraging engagement and cooperation from citizens. Crises such as COVID-19 pandemic impact the entity of policy capacity and pose major questions related to legitimacy, capacity, and trust among citizens. Therefore, trust building mechanisms should be incorporated into the design and implementation of data tools to avoid crippling public backlash.

Economic Resilience

Initial domestic conditions related to health and fiscal governance determined the degree of affection and response in developing economies[6]. Emerging markets and developing economies were affected more severely than the advanced ones. Research shows that low economic diversification is one of the leading factors of economic fragility during the crisis times.

With regards to economic policies, recent post COVID-19 measures tend to focus on businesses, employment, and skills in a post COVID-19 setting, promoting investment in industrial Internet of Things (IOT) and supply chains, fostering 5G industries.

However, proper post COVID-19 national recovery strategies can only be developed in the presence of resilient urban governance systems. Particular attention should be paid to vulnerable groups. Improving centralised data management system for vulnerable groups, transparency and usage of digital/IT tools must be employed to ensure effective delivery of public services to citizens.

Remote working (teleworking) will be much more widely practiced after the pandemic while business travel might not be needed as much as before as well as office buildings. Thus, it is essential for governments to allow capital and labour reallocation as per structural changes.

Quarantine Efficiency

Experts are still hesitant to say whether the world has transitioned from a pandemic to an endemic as it is not clear where COVID-19 is heading next.[7] Many countries implemented a number of nonpharmaceutical interventions to control the spread of the virus; however, recent evidence suggest that given devastating costs of lockdowns, there was no negative correlation between the degree of lockdown measures and COVID-19 fatality. Currently governments are lifting restrictions based on the fact that vaccines provide good level of protection from the virus. Various public health measures are being implemented to slow down the spread and flatten the

GENERAL CONCLUSIONS

curve while increasing research and production capacity for effective vaccines around the globe.

When treated as an endemic, COVID-19 will no longer be a health emergency, so restrictions may not be mandatory any more, which will allow health officials to contain the diseases with less disruptions and costs for the public. Endemic, however, is not synonymous with harmless. Researchers note that viral delta and omicron variants will continue taking a major toll. However, in case of dominance of a less transmissible viral strain, both mortality and morbidity rates will be considerably lower.[8]

Healthcare Management

The pandemic introduced new opportunities for strengthening resilience in healthcare systems in response to variety of the emerged problems. The examples include advances in telehealth, balanced care between patients with COVID-19 and other comorbidities, new facilities, protocols, and support of the private healthcare system for additional financial and human resources. For instance, due to emerging and evolving needs, digital health and telemedicine solutions based on smartphone apps have gained increased popularity by basically bringing the 'hospital into the home'.

South Korea benefited from a large number of beds, prior investments, and a stronger public health response system, given its experience handling previous outbreaks. Several hospitals in Boston, Massachusetts, collaborated to share data on the availability of hospital beds to efficiently route patients based on their clinical need and the available capacity, so that patients are taken to central specialty hospitals rather than the nearest hospital. This approach was also successfully implemented in Canada, the Netherlands, Denmark, and Australia.

The challenges that still remain are the long COVID-19 symptoms, which require further research and protocols to fight them as well as mental health complications, reinforced by the pandemic.

Vaccination Rate

The availability of the COVID-19 vaccine is a key step toward ending the pandemic and transitioning into an endemic. The issue of vaccine equity well persists as the global production of the vaccines has been uneven, progressing in advanced countries and delayed in low income ones.[9]

Out of 65.4% of the world population receiving at least one dose of COVID-19 vaccine, only 15,8% of people in low-income countries have received at least one dose.

Hereby, as of now, the model of global vaccine distribution is based on financial competition for limited vaccine supplies: Wealthier countries have been able to respond to the threat of the virus by securing enough doses while poorer countries are being forced to rely on voluntary donations through schemes like COVAX. The pressure on global supplies will continue as booster doses are rolled out, further diverting much needed doses from those countries struggling to complete even initial vaccine courses. Still, authorities should not rely fully on immunisation rate of the population as the virus is evolving rapidly and new variants occur, making the vaccines less effective against them. Instead, governments should work on containment policy more, evaluating risks and possibilities that the threat brings.

Cultural Compliance

Cultural norms tend to impact people's behaviour, social values and norms, civic participation, and economic activities. Research shows that culture can impact citizens compliance – the degree to which citizens tend to adhere to measures during the COVID-19 pandemic such as mask wearing, social distancing, etc. Thus, 'tight' countries like Germany and East Asian countries are described as formal and disciplined while 'loose' countries such as the USA and Brazil have weakly defined norms and are more permissive.

The pandemic has granted a great chance to study how individualism/collectivism influences the trajectory of a pandemic. Research shows that the value connected with individualism can exacerbate the spread and severity of COVID-19 through absence of social cooperation and policy. Countries that rated high in individualism, with high mortality rates to match, included the United States, the UK, Belgium, and Italy. In contrast, countries with higher levels of collectivism such as Thailand, Singapore, and South Korea had much lower mortality levels.

GOVERNMENT EFFICIENCY – KEY ACTORS EVALUATION

The past 2 years have been powerfully challenged by the pandemic. As the COVID-19 crisis spectacularly exposed problems in the public governance realm, it also gave an opportunity to get rid of the bad institutional inertia and work on existing drawbacks. Lessons from the global experience suggest that high-level leadership and well-organised stimulus, together with a degree of flexibility, were the prerequisites for success.

From 2020 to mid-2021, cities rebuilt not only their healthcare but also their economy and adapted to COVID-19 realities at a managerial level. From mid-2021 to mid-2022, contextual factors such as quality of leadership and trust in government have impacted the extent of success of policy - making across the globe.

Coordination Among Government Levels

The COVID-19 pandemic has revealed the fragility of the urban systems across the globe like never before. The central question now for the city leaders, administrators, and experts is *how to translate the lessons learned from the pandemic towards governance and institutional frameworks to increase urban resilience.*[10]

From 2020 to mid-2021, the lack of decentralised governance and resources at the local level made it challenging for cities to respond to the crisis efficiently.[11] For instance, the lack of analytical capacity in China resulted in failure to effectively collect and share information about COVID-19, so proactive decisions to mitigate the crisis could not take place, which consequently weakened the collective response globally.[12] There were also doubts with regards to the data and information provided by China. One should emphasise that there were no questions from WHO or other key organisations on the flawed data collection and analysis provided by the Chinese government. However, media and news, through investigative journal methods, questioned the authenticity of data provided and inquired hidden data issues.[13]

It is also observed that, regardless of development level, large countries have had a harder time to contain the virus than smaller countries. Brazil, India, South Africa, or the USA put much more effort in battling the virus spread than Georgia, Mauritius, New Zealand, or Slovakia.[4]

Institutionally, centres of government (COGs) in large countries have a more challenging coordination task, combatting virus outbreaks across their vast territories and, potentially, across various decentralised authorities. Other factors such as quality of leadership, legitimacy, credibility, and trust in government have shown to improve or worsen the outcome of coordination efforts.

The UAE's centralised decision-making capacity has allowed the government to make timely decisions and implement effective policies across various levels of the Emirates. This collaborative approach was based on high level of mutual trust between UAE political leaders and local government officials, working closely with health professionals and experts, unlike countries such as Sweden with high levels of trust in government but delegated responsibility to public servants (bureaucrats).[14]

The pandemic demonstrated the federal division of powers in Austria as a structural weakness in governance. In Austria, epidemiological responsibilities are divided between the federal and the regional governments. Despite this division, the system performed rather well, but the cooperation between the provinces and centres did prove to be challenging in relation to region-specific coronavirus measures. This does raise the question if the crisis management in Austria would perform better in a more centralised setting and whether it is worthwhile to decentralise crisis management.[15]

Data Governance

It is important for governments to be able to provide accurate and reliable sources of news and updates for its citizens, especially during a global crisis. The pandemic has demonstrated new, more pressing demands for the digital government services to procure assistance and solutions to cope with the plague in a timely manner.

The COVID-19 data tools also emphasised the issue of access equity. For the sake of efficiency, governments across the world would often launch contact tracing applications, which neglected citizens without access to mobile internet or smartphones. The 'Healthcode' in China and 'TraceTogether' in Singapore are examples of exclusive technology, which later on offered people without smartphones alternatives such as the TraceTogether token.[5]

GOVERNMENT EFFICIENCY – KEY ACTORS EVALUATION

On the contrary, Hong Kong's alternative to LeaveHomeSafe was to allow citizens to simply write down their names and phone numbers instead.[5] Such examples suggest taking into account factors of inclusion and accessibility into data solutions as well as possible options for digital contract tracing for countries that do not have relevant infrastructure.

Public Trust

Crises such as the COVID-19 pandemic do affect the entity of policy capacity and pose major questions related to legitimacy, capacity, and trust among citizens.[14] Public trust is one of the most external variables, which is affected by the GovTech solutions such as contact tracing apps. For instance, the rollout of the contact tracing applications in China, Hong Kong, and Singapore caused their respective governments to experience different levels of distrust from their citizens. In China, citizens trusted the healthcode despite lack of transparency; however, that trust abrogated when the city of Hangzhou attempted to expand the code to more general situations. In Singapore, the levels of trust dropped due to past incidents of health data breaches and government miscommunication on usage of the TraceTogether data.[5]

UAE put out several smart solutions to detect COVID-19 cases: ALHOSH UAE app, smartwatch to help monitor isolating patients, Stayhome app, and TraceCOVID-19 app, to name a few.[16] Overall, the UAE government legitimised the implementation of such policy measures due to precise, well-timed messages, guided public reactions, and fostered public trust.[14] Research shows that trust in the government in the UAE has risen by 7% from 2021 to 2022 (87%), and so did trust in the healthcare authorities: a 7% rise, or 87% as of 2022.[17]

Governance struggles that arise from implementing digital contact tracing alone might be universal. A normative approach is recommended to be employed when selecting and regulating data technologies, so that potentially dangerous and unexpected side effects in the long run can be avoided. Trust building mechanisms should be incorporated into the design and implementation of data tools to avoid crippling public backlash.[5]

Smart Cities

The availability of the smart city infrastructure is found to be a crucial factor that consolidates preparedness for the pandemic through integrated management and opportunities to predict certain patterns related to pandemic.[18]

Countries like China, the USA, the UK, and Italy deployed data-driven, AI-enabled systems to achieve social distancing using Deep Learning algorithms. These systems monitor the conditions and send alerts to those who are in the proximity of potentially infected citizens. This also applies to citizens who did not respect rules of social distance by wearing masks and such.[18]

Chinese state-backed AI company, Cloud Walk, designed a special quarantine hotel management system, which analyses surveillance camera footage to see if any worker/traveler has broken quarantine rules. In some cities in China, smart magnetic locks were installed by the community workers on the doors of those in the isolation period. Every time the door is opened, the lock sends notification to the workers.[19] Another example is South Korea's Epidemic Investigation Support System (EISS), which is built on the country's smart city data system with the purpose to allow sharing of urban planning information between authorities. During the pandemic, it was used to track the spread of the virus as an innovative application of smart city technology. The key to success was engagement of the citizens in the country.[20]

Other specific technology that has been emphasised as contributing to the pandemic control is 5G internet. It improves the efficiency of relevant interventions such as telemedicine, contact monitoring, and supply chain management.[21] During Q1-Q2 2021, Seoul had the fastest 5G among 30 major cities in the world, with a median download speed of 467.87 Mbps. Abu Dhabi followed with the second fastest median download speed of 421.26 Mbps and Dubai was third (417.07 Mbps).[22] However, simple presence of digital technologies does not imply that the benefits would automatically reach its citizens. Measuring performance of the smart city is, therefore, critical to ensure efficient delivery of policies, progress tracking, and improvement of government accountability.[23]

Economic Resilience – KEY ACTORS EVALUATION

Appropriate policy mix and farsighted actions of the public institutions are essential to alleviate the devastating impact of the crisis and to maintain economic growth. Governments need to promote positive changes in the labour market and regulate the macroeconomic and fiscal regimes. Policymakers also need to tackle the post-crisis 'fatigue' of societies, as COVID-19 made global inequality much worse. While developed countries might recover steadily, developing countries face much poorer prospects for economic recovery.

Diversification for Resilience

The level of stringency of lockdown measures implemented by the national, local, and regional authorities to control the virus spread had a serious impact on mobility patterns for shopping, business, and leisure activities.[24] Research shows that when it comes to European economies, the strictness of lockdown measures, economic structure, and quality of governance are three main drivers and factors identified that explain why the crisis hit countries differently. For instance, Switzerland has proved to be resilient to the COVID-19 pandemic due to its diversified economy with relatively low reliance on entertainment and hospitality sectors. The country also has significant fiscal space to support firms and households.[25]

On the contrary, limited economic diversification made economies in Central Asia and the Caucasus especially vulnerable to external crises. Dependence on oil and mining exports along with the drop in oil prices and the current COVID crisis have led to significant drops in economic activity and sizable currency depreciation in Kazakhstan and Azerbaijan.[26]

Resilient Urban Governance

Proper post COVID-19 national recovery strategies can only be developed by the resilient urban governance systems. Municipal finance is a crucial aspect of recovery plans and sustainable development. The 'Barcelona Deal' is a great example of how urban governance response is key to supporting economic recovery for its citizens as well as allowing input from relevant stakeholders.

The 'barcelona deal' (pacte per barcelona) emerged from the realisation that the magnitude of crises created by the COVID-19 pandemic demands a new approach on a vision of the city, shared by local communities and citizens. Previously, participatory governance mechanisms in Barcelona required passing municipal laws to settle who can partake in participatory councils, which ultimately proved to be inflexible and slow for the scale of the COVID pandemic.

In contrast to this, Barcelona developed a flexible participatory mechanism without requiring to change current laws or norms. In order to manage the complexity of such stakeholder engagement coordination, the task of creating a recovery roadmap was broken down into the 'main table' and five thematic working groups such as digital economy, economic recovery, urban model and social rights, education, science, international, and sports. That way, a larger number of stakeholders could contribute to a thematic area depending on their expertise/interest.[27]

According to Wuhan's key policy document[28], in alignment with the post COVID-19 policy direction, Wuhan, city in China, will also promote innovative industries to form sustainable economic structure that facilitates the national city development strategy. Wuhan plans to create a digital twin by promoting investment in industrial IOT, supply chains, fostering 5G industries. Other tasks include expanding the economic influence of the Wuhan metropolitan era, establishing national laboratories for medicine and industrial innovation centre and attracting large enterprises to set up headquarters in Wuhan.[29]

Economy Rescue Packages

Almost all countries have implemented fiscal support programmes since COVID-19 hit, with significant diversity in composition and volume of these fiscal stimulation programmes[30]. Suitable recovery policies need to be implemented to increase resilience, especially when it comes to vulnerable groups.

National pandemic response plan in Vietnam included initiatives related to zero interest loans for businesses, reduced electricity prices, tax breaks, and delayed tax payments. Two social relief packages addressed vulnerable households. However, there were several implementation gaps: low capacity data management, which presented a challenge for government to collect data on citizens, and aid unavailability to people without legal documents or those working in informal sectors. Homeless people, migrants without residential status, small or unregistered informal household businesses, and people who lost income due to the pandemic before a particular date were excluded from the beneficiary list.

Economic Resilience – KEY ACTORS EVALUATION

On top of that, delays related to bureaucracy and several months for distributing allowances were barriers that prevented vulnerable groups from getting support. In Hanoi, beneficiaries had to submit the residential status copy and a request form. If people were not residents, they had to submit a letter proving they did not receive support in their hometown, all of which was impractical during quarantine.

Distribution systems designs should take into account privacy and security of beneficiaries. In Vietnam, systems relied heavily on cash payments, which increased the risk of corruption[31]. Improving centralised data management system for vulnerable groups, transparency, and usage of digital/IT tools must be employed to ensure effective delivery of public services to citizens[32].

Economic Policy Lessons

Policy measures that respond to the liquidity demand are most appropriate to a recession caused by an epidemic. When it comes to supporting businesses, policy instruments that take into account whether the company was profitable before the epidemic and whether its business model will be thriving after the epidemic are recommended. This way, the risk of keeping companies whose business model is not viable is reduced[33].

Short-time work allowance schemes that help companies adapt to reduced demand and support income of the household, tax deferrals, public loan guarantees for companies that have been affected the most by the pandemic are some examples of such measures. For instance, short-time work schemes grant companies an opportunity to decide the staff extent to put on short time work. As demand for their products increases, the decisions can be reversed. Additionally, companies do not risk overcompensating part of employees as it is done with direct cash transfers to individuals[34].

As the pandemic has witnessed a strong push for digitalisation, the behaviour may well change for a longer time, leading to significant structural change.

Remote working (teleworking) will be much more widely practiced after the pandemic; business travel might not be as much in use as before as well as the need for office buildings. It is essential for governments to allow capital and labour reallocation as per structural changes. The productivity growth and structural change will be slowed down if generous economic support measures are kept in place for too long.[34]

Post COVID-19 Strategy

The post-COVID state might entail the adaptation of integrated crisis response, meaning new public health policies that were developed during the crisis will become a part of importance of the health policy portfolio.

For instance, governments will not only have plans to guarantee their preparedness in case of future crises but also mobilise more resources and capacity for further actions. Such efforts are represented by not only further provision of material and staff but increased pandemic response coordination at national government levels[23].

With regards to economic policies, recent post COVID-19 measures tend to focus on businesses, employment, and skills in a post-pandemic setting.

Bahrain rolled out the multiyear economic recovery plan that seeks to invest $30 billion in strategic projects to fuel post COVID-19 economic growth, provide more opportunities for citizens, and attract foreign investment[35].

A 'Stronger BC' plan for the British Columbia province in Canada provides the scope to create a low carbon economy that works for everyone[36].

To address economic consequences of COVID-19, the French government set out its 'France Relance' €100 billion recovery plan, which, besides supporting businesses and rethinking production models, also aims to speed up the ecological transition of France worth €30 billion.[37]

The UAE will strengthen local non-oil sectors and trade by adopting the 'Export Development Policy' to increase exports and open new markets to support country's foreign trade and increase contribution of the non-oil sectors in its GDP. Dubai decided to encourage the Creative Economy Strategy to double the contribution of the creative industry sector to its GDP from 2,6% to 5% by 2025.[38]

Other post COVID-19 measures might be targeted at adapting the capacity to support the economy in conjunction with policies related to the health crisis. One example of such health promoting policies is a paid sick leave during the COVID era. It is a simple illustration of how economic and public policies intertwine, which supports more people getting tested, isolation of cases, quarantine, etc. Such policies promote health even beyond the pandemic for chronic, slower paced disasters such as diabetes and the rest of chronic conditions.[39]

QUARANTINE EFFICIENCY – KEY ACTORS EVALUATION

Many experts are still hesitant to say whether the world has transitioned from a pandemic to an endemic so far. As more countries roll back strict measures and aim to declare the pandemic's end soon, some are just starting to shift their attention: Vaccination continues to remain important. The focus here is on the longer-term testing and surveillance approaches integrated into strengthened national health systems.

'Living With COVID'

The use of lockdowns is a unique feature of the COVID-19 pandemic that has not been seen to such an extent before. The current evidence confirms that given the devastating effects and social costs of lockdowns, there was actually no strong negative correlation between the degree of lockdown and COVID-19 fatalities.[40]

More countries with high vaccination rates significantly eased restrictions in a decisive shift towards 'Living with COVID' approach: making mask-wearing optional or allowing travellers to enter without a quarantine in Abu Dhabi.[41] Safe co-existing with COVID-19 that results in relative success is also seen in Singapore. During a recent spike in spring 2022, the elderly in Singapore were already fully vaccinated and the overall death rates were low.[42]

By contrast, in Hong Kong, with a similar overall vaccination rate and highly tightened social distancing measures, a high mortality rate during the ongoing omicron wave is being driven by deaths among unvaccinated persons aged ≥60 years[43]. Hong Kong's low vaccination rate in older groups might be due to vaccine hesitancy or complacency over the government's earlier success with its 'zero COVID' policies. The 'dynamic zero infection' strategy is pursued there, in line with the current approach adopted in mainland China[44]. As more countries that have chosen to live with COVID-19 start to re-open, the economic costs of the zero-COVID policy gradually began to outweigh its human benefits.[45] This may accentuate the need for Beijing to reassess the policy to better adjust to changing internal and external circumstances and to minimise the disruptions of the pandemic to global supply chains and economic growth.

Virus Mobility

The COVID-19 vaccine has changed the course of the pandemic. In early 2021, Israel was first to show that vaccines in fact bend the curve of COVID-19 infections.[46] Public policy in most advanced economies is focusing and heavily relying on vaccination in hope it will bring down the number of severe cases and deaths while allowing restrictions to be lifted.[47] However, with incomplete uptake of vaccines, waning immunity, and imperfect transmission prevention, additional waves of contagion was already seen as well as may be expected again. The rapid spread of the highly transmissible omicron variant showed that the existing vaccines are less effective at preventing infection against new variants.[48] Thus, while relying on vaccination only is insufficient, and a strategy that recognises and slows down the emergence of new variants and limits their spread is needed.

There are various public health measures implemented to slow down the spread and flatten the curve, while increasing research and production capacity for effective vaccines around the globe. In China, where officials are seeking to reduce the caseload to absolute zero, constant mass testing is enforced and entertainment venues are closed. To ensure that COVID-19 is detected as quickly as possible and to slow down its global spread, free symptomatic testing is available for the population in high-risk settings in the UK.[49]

Given the fact that human mobility is critical to the spread of COVID-19, new public policies should be complemented by a rigorous testing strategy that stops new variants from spreading while keeping borders open to human travel. This way, most countries can avoid repeated lockdowns and their large health, economic, social, and personal costs.

Travel Restrictions

There have been extensive travel restrictions in place around the world over the last 2 years that have eventually failed to prevent the spread of COVID-19.[50] Experience with omicron showed that countries are quick to introduce travel restrictions once a new variant of concern is identified and are then slow to remove them.[51]

As the World Health Organization highlighted, by the time that the variant emerges, it is likely already [...]

QUARANTINE EFFICIENCY – KEY ACTORS EVALUATION

[...] circulating in communities around the world. Travel restrictions will only delay the peak of infections by a maximum of 4 days, while heavily contributing to the economic and social stress experienced.[52]

Many countries have already reopened borders and fully removed all entry requirements. Currently visiting Norway[53], Mexico[54], Iceland[55], Bahrain[56], Maldives[57], and Grenada[58] is like visiting in pre-pandemic times. Some countries such as Egypt, Brazil, Turkey, and Tanzania have relaxed border restrictions with no mandatory quarantine[59]. Despite the global trend, in Japan, travel for tourism is still not permitted,[60] and foreigners from a number of countries are banned to enter the country unless special exceptional circumstances are found.[61] The country hopes to reopen for some leisure tourists in summer 2022.[62]

Pandemic vs. Endemic

As more people get vaccinated and boosted, COVID-19 becomes more manageable. On 3 March 2022, Brazil considered downgrading COVID-19 to the status of an endemic – a recurrent, typical disease frequent in the region but for which there is already an effective response by the healthcare network.[63] Malaysia commenced its transition to the endemic phase[64] and reopened its borders from 1 April 2022.[65]

If treated as an endemic, COVID-19 will no longer be a health emergency, so restrictions for the vaccinated population may no longer be mandatory, allowing health officials to contain the disease with far fewer disruptions to the public at large.

However, WHO officials warn endemic is not synonymous with harmless.[66] For example, Thailand is battling with a high number of cases of COVID-19, dominated by the omicron variant, while pushing to downgrade from pandemic status by July 2022.[67]

Domestic Biomanufacturing Production

The biopharmaceutical industry has been facing unprecedented pressure to rapidly develop and manufacture new treatments and vaccines to fight the pandemic as well as continuing to provide a steady supply of life-saving medicines to other patients.[68] There have been many major advances in biotechnology prior to COVID-19 and the vast amounts spent will have long-term implications in multiple fields.

For example, back in 2020, the Canadian government Invested more than $1 billion to support COVID-19 vaccine and therapy clinical trials led by the private sector.[69] As the country was seeking to rebuild its biomanufacturing sector and support made-in-Canada solutions to global health challenges, Canada significantly scaled up the domestic biomanufacturing capacity.[70]

Public policy leaders should look for solutions that will contribute to global health resilience such as reducing inequalities in access to vaccines for different countries. As an example, the government of the Republic of Korea, together with WHO, has established a global biomanufacturing training hub that will serve all low- and middle-income countries wishing to produce biologicals, including COVID-19 vaccines, insulin, monoclonal antibodies, and cancer treatments. This transfer of technology will contribute to equal access to health countermeasures for countries like Bangladesh, Indonesia, Pakistan, Serbia, and Vietnam.[71]

Restrictions for Unvaccinated

As governments rush to get everyone vaccinated, they have increasingly turned to two new tools: restrictions targeting unvaccinated people specifically and mandates requiring certain groups of people or even the whole population to get vaccinated. According to the recent data, 48 countries have vaccine mandates by category in place.[72] Countries, including Indonesia[73], Tajikistan[74], and Turkmenistan[75], made vaccination mandatory for the entire adult population.

Ecuador[76] and Puerto Rico[77] have mandated vaccination for all those over the age of 5 to attend school. In Poland[78], Pakistan[79], New Zealand[80], and Saudi Arabia[81], these policies are very targeted – the most commonly mandated categories are government officials, public sector workers, healthcare workers, and teachers.

The substantial restrictions that nonvaccinated people face vary drastically. The example of Austria is particularly notable, having introduced a stay-at-home order for nonvaccinated people in November 2021.[82] Access to interregional travel and long-distance public transport, visiting venues, including cinemas, theatres, bars, and some stores, is limited for unvaccinated population in Germany[83] and Canada[84]. In Abu Dhabi emirate, nonvaccinated individuals can access events, tourist attractions, and cultural sites by presenting a negative PCR test result obtained 48 hours prior[85]. In Mexico, Ethiopia, Tanzania, and South Africa, there are no official vaccination mandates or passes affording freedoms based on vaccination status.[86]

HEALTHCARE MANAGEMENT – KEY ACTORS EVALUATION

The COVID-19 crisis has introduced new opportunities for strengthening resilience in healthcare systems in response to the diversity of problems. The examples of successful health system responses include advances in telehealth, balanced care between patients with COVID-19 and other comorbidities, new facilities, protocols, and support of the private healthcare system for additional financial and human resources. Rethinking healthcare delivery and adopting strategies with demonstrated success will allow the world to be better prepared for future crises.

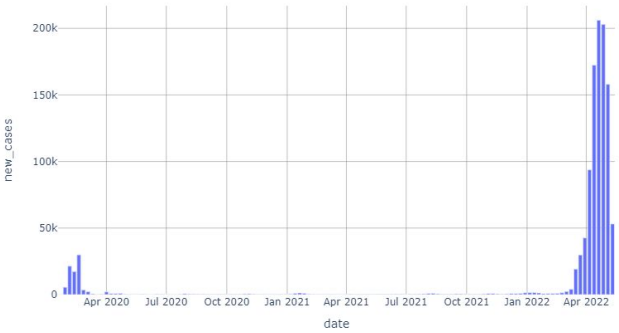
Learning Lessons

Health systems' resilience is key to learning lessons from country responses to crises such as COVID-19.[87] The governments must not only compensate for disrupted healthcare services during the current pandemic but also invest in strategies for better health system resilience for future emergencies.[88]

Health system design and organisation before the pandemic is associated with health service resilience as observed in South Korea. The number of hospital beds per capita in South Korea is about three times higher than the OECD average.[89] Thus, reallocating a large share of this capacity to the COVID-19 care went without substantial negative effects on other services. South Korea has also benefited from prior investments and a stronger public health response system, given its experience handling previous outbreaks.[90]

However, not all high-performing health systems were resilient enough against COVID-19. The lessons of the SARS outbreak and attempts to prepare specifically for a new coronavirus outbreak were not always the case for China.[91] During the initial outbreak, the health system of Wuhan, one of the best facilitated cities for hospital beds in the country, was not equipped enough to deal with the flood of COVID-19 patients.[92] Despite the implemented 'dynamic zero infection' strategy, since mid-February 2022, China has faced an unprecedented omicron wave with thousands of daily cases.[93] Nevertheless, so far, China has given no sign of backing away from its strategy in the hope of reducing infection, taking advantage of its technical strengths to ensure this policy.[94]

Figure 1. Number of Weekly Cases in China[95]



Source: Our World in Data, as of 5 May 2022.

Bringing Technology Closer to Patients

COVID-19 has posed serious risks to healthcare workers and patients in the healthcare setting. Due to emerging and evolving needs, digital health and telemedicine solutions based on smartphone apps have gained increased popularity by essentially bringing the 'hospital into the home.'[96]

Apps for digital contact tracings that are used to collect and analyse data on people's proximity, location, movement, and health status became prevalent in Asia. However, while providing 'health bridges' to millions of people, some of them had been reported to have serious privacy flaws[97] and ethical problems, including the official Pakistani app 'COVID-19 Gov PK'[98] and 'Aarogya Setu' app developed by the Government of India.[99]

Meanwhile, the apps developed in Europe and North America remain focused on symptom checking, remote monitoring, video consultation, health information dissemination, and raising awareness. Some examples include 'British Columbia COVID-19'[100] in Canada, 'NHS COVID-19' in England and Wales[101], and '1-Check'[102] developed by University of Nebraska Medical Center, USA.

HEALTHCARE MANAGEMENT - KEY ACTORS EVALUATION

Healthcare Inequity

The COVID-19 pandemic has led to an unprecedented focus on one patient group and transparency on its metrics while other patients experienced a striking inequity in healthcare, including access to healthcare facilities, admission to hospitals, and quality of care.[103]

There are several strategies to facilitate care of non-COVID patients even as hospitals are stretched to absorb waves of patients with COVID-19. For instance, the logistics strategy known as 'location pooling'[104] balances demand across hospitals by combining essential non-COVID clinical services from multiple locations in one place, so that each of these services is concentrated at one location.

Both the feasibility and positive outcomes of utilising this approach was demonstrated during the initial COVID-19 wave. Several hospitals in Boston[105] collaborated to share data on the availability of hospital beds to efficiently route patients based on their clinical need and the available capacity, so that patients are taken to central specialty hospitals rather than the nearest hospital. This approach was also successfully implemented in Canada, the Netherlands, Denmark, and Australia.

Long COVID

The post-acute COVID-19 syndrome, a phenomenon known as 'long' or 'chronic' COVID-19, is now considered to be a complex systemic disease. Up to 75% of patients describe at least one symptom[107] (brain fog, breathlessness or exertion, fatigue, sleep disturbances or memory impairment) that lasts up to several weeks or months after the onset of illness and is not explained by an alternative diagnosis.[108]

In response to an increasing need to care for the chronic COVID-19 patients, several private specialty clinics with both physical and mental rehabilitation setting were established in UAE (Abu Dhabi)[109], Australia (Canberra[110] and Sydney[111]), Bahrain[112], Canada[113], and the United States[114].

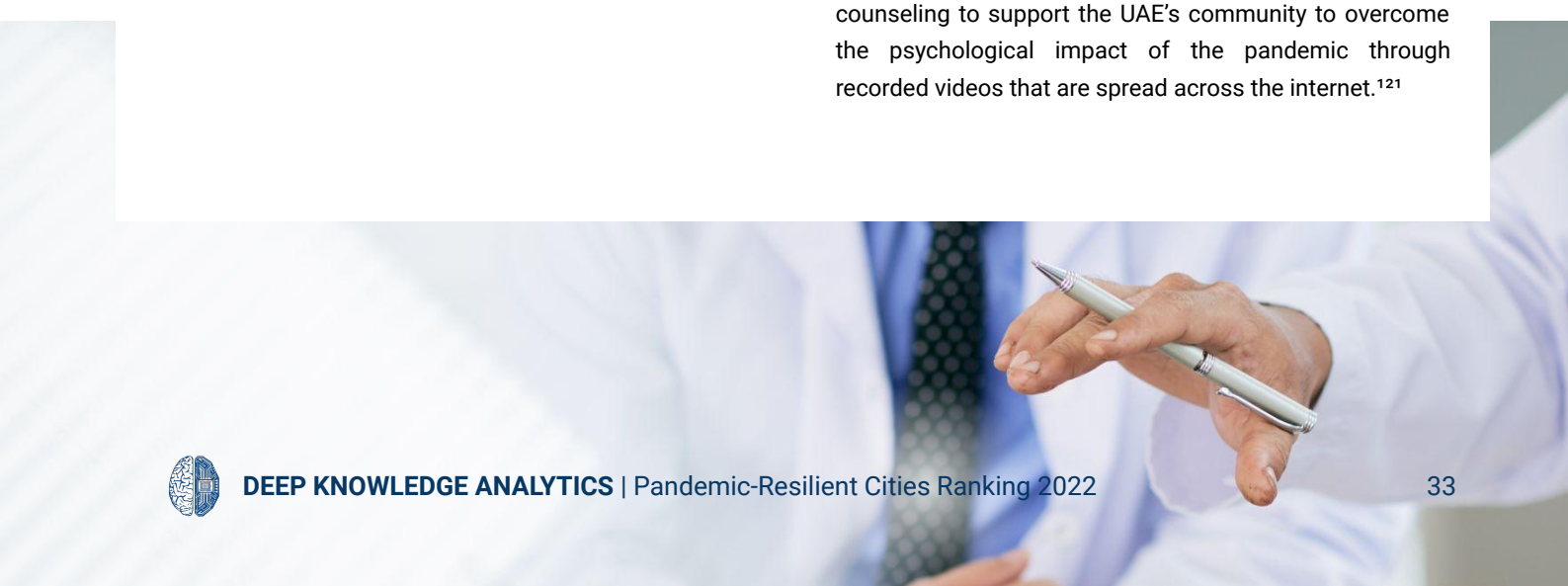
Mental Health Challenges

Due to the pandemic, the declines in health services of varying magnitude and duration were found in every country around the globe.[115] The significant disruptions to the delivery of mental health services were reported in Chile, Italy, Mexico, the Netherlands, Australia, and many more countries.[116]

Prior to the pandemic, the World Health Organization estimated that depression and anxiety disorders cost the global economy US $1 trillion annually in lost productivity.[117] With COVID-19 exacerbating mental health challenges, it is essential that countries and employers provide and strengthen mental health support available to employees.

For example, the United Arab Emirates have established not one, but four national programmes to address these mental health challenges across the individual, the society and the country levels.[118] Pursuing National Strategy for Wellbeing 2031, the UAE government aims to spread awareness and prevent mental health issues by implementing policies, establishing designated facilities, and improving mental health through research.[119]

In particular, to help federal government employees deal with the anxiety associated with COVID-19 through mental health consultations, a psychological and moral support programme Hayat, or the 'Employees Assistance Programme' was launched.[120] Another initiative called 'The National Campaign for Mental Support' involves offering counseling to support the UAE's community to overcome the psychological impact of the pandemic through recorded videos that are spread across the internet.[121]



VACCINATION RATE - KEY ACTORS EVALUATION

The availability of the COVID-19 vaccine is a key step towards ending the pandemic and transitioning into an endemic. Enough people need to have immune protection from the virus for it to become endemic, highlighting the importance of vaccination. The endemic means a constant presence in a community, thus instead of focusing on preventing transmission of the virus, the policymakers should aim to minimise severity of the illness and prevent overwhelming healthcare systems.

Vaccine-Induced Immunity and Boosters

The difference across countries in omicron surge has to do with population-level immunity and how much prior COVID-19 surges infected people. In places where there was a lot of transmission, currently there is a high probability of enough immunity. As seen in South Africa, where at the moment most of the transmission is omicron, hospitalisations and death are lower than in the previous waves.[122]

As more variants of SARS-CoV-2 emerge, available evidence shows that fully vaccinated individuals and those previously infected with the virus each have a low risk of subsequent infection for at least 6 months.[123]

Several late-stage clinical studies have shown that only vaccine-induced immunity may not be enough to halt infection from the omicron, but natural immunity to top up and a booster shot may help significantly.[124] To prevent fatalities from future new variants, a scale-up of antivirals, particularly a highly effective Paxlovid, is a critical issue.[125]

Boosters Distribution Worldwide

Even though it is recommended that vaccinated people receive booster doses 6 months after their initial shots, several countries cut their shot interval: South Korea, the Netherlands, Panama, and Philippines accelerated the third dose after 3 months since the initial shot.[126] Countries such as Israel, Chile, and Sweden are offering the fourth dose to older adults and other groups, despite the fact that the fourth vaccination is proven to provide a slight protection against SARS-CoV-2 infection.[127]

While several wealthy nations are encouraging booster shots for a wider population, there is a debate over the doses that could be used for unvaccinated people abroad. Some countries have bought up the vast majority of the world's available vaccine doses and have preordered the majority of future ones, presumably in case boosters were needed. Canada, for instance, has purchased enough doses to vaccinate its population nine times over[128] — far more than the country would need for a booster campaign. To ensure vaccine equity, global solidarity and collective action of donating the excess doses to the developing world are urgently needed.

Children Vaccination Concerns

The COVID-19 vaccine race initially focused on getting the elderly and medically vulnerable protected, before gradually moving through the rest of the adult population population and then children. There has been a debate over the merits of vaccinating children who do not have underlying conditions as the chances of them developing a severe illness from COVID-19 are lower than in adults.

As in case of Germany, vaccines were only recommended for medically vulnerable children, but in the wake of the spread of the delta variant, it was stated that 'the current state of knowledge, the advantages of vaccination outweigh the risk of very rare vaccine side effects'.[129]

In some countries around the world, children now account for the majority of cases. In September 2021, at the start of the fall school term in England, infections were increasing exponentially among children aged 5-17, at a time when vaccination rates were low in this age group.[130]

Certainly, inoculating children and young people, who can unwittingly transmit COVID-19 to others at higher risk of serious illness, is a critical step towards taming the pandemic.

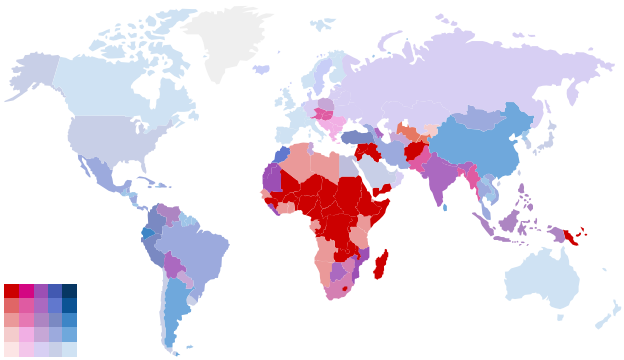
However, further steps must be taken to ensure continuity of learning while adhering to the stringent school health and safety precautionary measures. As an example, in order to gradually return all students to in-person learning this spring, every 2 weeks, routine free-of-charge PCR tests would apply to both unvaccinated and vaccinated students and staff in Abu Dhabi schools.[131]

VACCINATION RATE - KEY ACTORS EVALUATION

Vaccine Equity

Last year, the World Health Organization set an ambitious global target: 70% of the global population to be vaccinated by mid-2022.[132] As of 15 May 2022, 60,3% of global population is vaccinated. The overall number of vaccines administered has risen dramatically, but so has the inequality of the distribution: Out of 65.7% of the world population receiving at least one dose of COVID-19 vaccine, only 15.9% of people in low-income countries have received at least one dose.[133]

Figure 2. The Global Picture of Vaccine Inequity



Source: UNDP, as of April 27, 2022

The US and the UK governments are among those who donated the most money to COVAX, COVID-19 Vaccines Global Access Scheme (approximately $1-2 billion) in 2021. The scheme has been established to facilitate global vaccine distribution to 92 low/middle income governments.[134] However, hundreds of millions of vaccine doses provided were just a fraction of the 9.25 billion doses that were administered globally in 2021.[135] African countries received only 18.2 million of the 66 million doses they had expected through COVAX[136] in the first half of 2021, and most did not reach even 10% vaccination by the end of 2021.[135]

Currently, the model of global vaccine distribution is based on financial competition for limited vaccine supplies: Wealthy countries have been able to respond to the threat of the virus by securing enough doses to vaccinate their entire populations several times over while poorer countries are being forced to rely on voluntary donations through schemes like COVAX.

The COVAX model focuses on the redistribution of existing vaccine supplies, but this has proven to be insufficient.[137] The pressure on global supplies will continue as booster dose programmes are rolled out, further diverting much needed doses from those countries struggling to complete even initial vaccine courses. To meet growing global demand, production needs to be scaled up significantly.

Public Trust in Vaccine

The World Health Organization listed vaccine hesitancy as one of the top 10 threats to global health.[138] Even prior to COVID-19 outbreak, vaccine confidence and uptake were already declining in many parts of the world.

Various factors could be influencing this trend: anti-vaccine campaigns based on disproved studies linking vaccines to autism spectrum disorder, suspicions over corrupt schemes of pharmaceutical companies, or governments lacking transparency and credibility, etc.[11]

For example, in the Philippines, the controversy surrounding Dengvaxia[139], a dengue vaccine, back in 2017 has certainly impacted the population's trust in vaccines and has affected the country's COVID-19 vaccination programme. As of 1 May 2022, only 61.9% of the population in the Philippines is fully vaccinated, one of the lowest rates in the Southeast Asian region.[140] Despite available ample supply, vaccination lags have been reported, and the vaccination rate has been slowing down over the past 3 months, with 120,000-140,000 doses administered daily.[141]

COVID-19 vaccine willingness in the UK varies to a greater extent based on individual demographics and personal opinions about public sector officials and the government. [142] Given the fact that lower socioeconomic and minority ethnic communities have the highest rates of vaccine hesitancy[143], urgent action of policymakers and leaders is needed to promote public health messaging to build trust to encourage improved uptake particularly in groups who are at the most risk of negative clinical consequences of COVID-19.

CULTURAL COMPLIANCE – KEY ACTORS EVALUATION

Implementation of public policies cannot be done in a vacuum. Cultural norms tend to impact people's behaviour, social values and norms, civic participation, and economic activities. The classification of some social, cultural, and psychological drivers can be helpful to urban policymakers while identifying most relevant strategies and recommendations to involve citizens in public decisions and to improve social inclusion[144]. Moreover, culture can impact citizens compliance, meaning the degree to which citizens tend to adhere to measures during the COVID-19 pandemic such as mask wearing, social distancing, and more.

The impact of COVID-19 on smart cities asks for understanding the sentiment of citizens and estimations of the pandemic effects on individual views and people's degree of stress and disturbance. The intervention measures by the governments across the world are not the same because of cultural differences examined in this chapter. When threats become more prevalent, societies tend to tighten their social norms. Thus, 'tight' countries like Germany and those in East Asia are described as formal and disciplined while 'loose' countries such as the USA and Brazil have weakly defined norms and are more permissive. The behaviour of citizens, especially their ability to adapt to external environmental changes within the cultural context can be critical while determining the success of implemented applications, services, and new technological solutions in smart cities.

Individualism/Collectivism in Cultural Phenomena

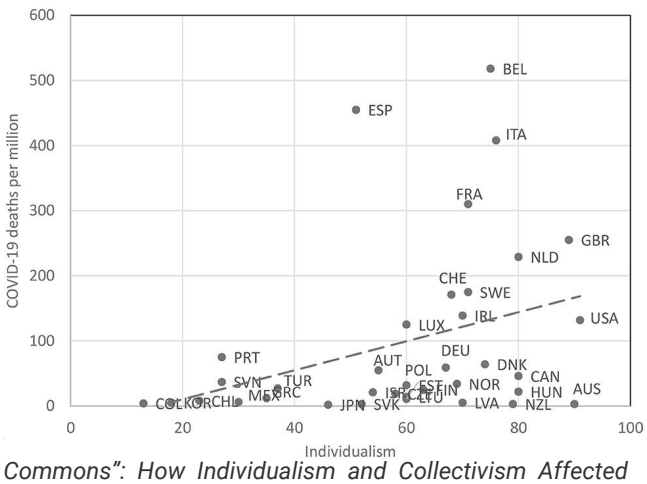
Government policies are more likely to be acceptable to the public and achieve desirable outcomes if policymakers take culture and values into consideration as collective actions from individuals eventually determine the effectiveness of government policies.

COVID-19 grants a great chance to study how individualism/collectivism influence the trajectory of a pandemic. Governments in countries where individualism is respected in economic and civic life may be more hesitant in forcing mobility restrictions. When imposed, people are likely to be less considerate of them, which prevents effective battle against the virus in the first place. Thus, the value connected with individualism can exacerbate the spread and severity of COVID-19 through absence of social cooperation and policy.[145]

'One cultural aspect that may explain the disparity in fatalities among different countries is the public cooperation and willingness to sacrifice to support the common good and adhere to health guidelines.'[148]

Researchers of the study[146] titled, "'The Tragedy of the Commons": How Individualism and Collectivism Affected the Spread of the COVID-19 Pandemic', examined correlation between individualism vs. collectivism, prevention measures at the personal level and the relation between countries' individualism (vs. collectivism) and the mortality rate. The study included data from 69 countries and has demonstrated that there is a clear correlation between the culture and individualism levels and more COVID-19 cases and deaths that occurred thereafter.

Figure 3. The Relationship Between Countries' Individualism Score and COVID-19 Deaths Within a Given Country for OECD Countries



Commons": How Individualism and Collectivism Affected the Spread of the COVID-19 Pandemic'.

It can be seen that countries that rated high in individualism, with high mortality rates to match, included the United States, the UK, Belgium, and Italy. In contrast, countries with higher levels of collectivism such as [...]

CULTURAL COMPLIANCE – KEY ACTORS EVALUATION

Thailand, Singapore, and South Korea had much lower mortality levels from the virus.

Authorities-Society Relationship

Experiences of countries presented here can certainly offer lessons for other countries. Their distinct trajectories are shaped by the institutional arrangements, national cultural orientations, and response of the population. The analysis confirms the joint role of cultural and institutional contexts in governmental policy shaping.

Technology and culture were key factors for a South Korean government to successfully contract the outbreak of COVID-19. Firstly, it has the fastest internet and high share of smartphone usage (88,5%), which contributed to success.[147] South Korea is special when it comes to nurturing its collective behaviour and a shared sense of responsibility. Responsible citizenship and participation based on Korean cultural and social norms has been a critical factor in mitigating COVID-19 outbreak in the country.[148] Recently, the country has relieved its test, track, tracing, and quarantine strategy, which contributed to keeping earlier waves in check as opposed to the record of more than 600,000 cases in March 2022.[149] This, however, is seen by the Health Ministry officials as the last major crisis that could bring Koreans nearer to normal lives by overcoming it. The number of Koreans who worry about the serious impact of COVID-19 has dropped to 48%, the lowest point since the beginning of the pandemic.[150]

On the contrary, Sweden ranks the weakest (11.11 out of 100) on the COVID-19 stringency index[151] along with Norway, the UK, Denmark, and Poland. Swedish response to COVID has been controversial as at the national level Sweden focuses rather on recommendations than requirements to encourage citizens to determine their behaviour voluntarily. The elements of the 'loose culture' that lie in the sense of individual responsibility and high trust in Swedish society are key elements here.[152]

There are also 'loose' countries like France, known for enacting soft measures in the beginning of the pandemic to mitigate the spread of COVID-19. However, as the virus began to spread, the response strategy of the country changed to suppression, making the country the one with the most stringent restrictions in the world.[152]

France has observed the last peak in the number of recent cases in the beginning of April 2022, with maximum of about 200,000 of new cases per day. However, France was still no longer tight according to Stringency Index (18.82 out of 100 as of 15 April 2022).[151]

As can be seen, despite the fact that the countries observed above are unitary states with identical levels of health resilience, as ranked by the Global Health Security Index in 2021, the strategies they employed to combat COVID-19 are different due to institutional and cultural contexts, which gained worldwide attention and global debate.[153]

Power Distance and Spread of COVID-19

Citizens of countries demonstrating larger levels of power distance seem to tolerate a hierarchical order without requiring any further justification more easily. In countries with lower levels of power distance, societal forces are strained to balance the power distribution. Hereby, the United States and the United Kingdom with lower power distance show higher number of hospitalised and intensive-unit care patients compared to Malaysia with higher power distance.[154]

Middle East countries in general moved quickly to stringent control measures, following extensive outbreak of COVID-19 in Iran in March 2020. North African countries such as Morocco and Tunisia also followed this trend by closing borders and schools, banning public gathering, and enforcing strict lockdowns.[155]

One of the barriers towards consistent response to the pandemic across the MENA region has been the healthcare system quality, which varies widely, from those in the Gulf Cooperation Council (e.g. UAE, Qatar, Saudi Arabia) to countries in North Africa.

However, despite wide differences in the level of healthcare investment, various internal economic situation and political conflicts (Lebanon), ongoing movement of refugees around conflict zones (Syria and Yemen), the initial stringent responses in the early COVID-19 pandemic in MENA were still very effective out of clear necessity.[155]

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY

Containment policies play a crucial role in decreasing the spread of COVID-19. Unlike the other government policies in response to the pandemic, containment and closure policies caused much debate since not only they prompt resentment from the population but also slow down economic growth. We observed a wide range of degrees of containment policies: from China's full-scale lockdowns to Sweden's lack of any rigorous closure measures. Thus, countries' responses to contain the virus differ drastically from one country to another, allowing us to assess the impact of certain decisions in a comparative analysis.

We conducted an analysis based on a methodology presented in the study by Xiu et al. (2022)[156], with the data that we collected for a period from 1 September 2021 to 20 April 2022. Our findings are mostly in line with the original paper and have three important policy implications. First, harsher stringency policies decrease the rate of spread of COVID-19. Second, some containment policies are more closely associated with a lower spread of the virus. Third, policies should be applied according to the cultural context of a country.

Data, Samples, and Variables

We collected data for daily COVID-19 parameters for the major countries from Our World in Data website for the period between September 2021 to mid-June 2022. We also collected stringency index and stringency components daily data from the Oxford COVID-19 Government Response Tracker for the same period. In addition to that, we gathered a range of country-specific parameters such as the vaccination rates, GDP per capita, population parameters, health-related and other parameters for 100 countries of our interest. We merged the datasets and ended up with 10,666 observations for 78 countries.

Two key variables of the analysis are 1) daily growth rates of COVID-19 infections *Cases_Grow* and 2) government policy stringency index *Stringency_index*, a measure of strictness of government containment measures against COVID-19. To be specific, the growth rate for a specific country *i* on a day *t* is calculated in the following way:

$$Cases_grow_{i,t}=(New_Cases_{i,t}-New_Cases_{i,t-1})/New_Cases_{i,t-1}$$

The *Stringency_index* represents a composite measure, with scores from 0 to 100 (100 is the strictest response). We also composed three additional measures of stringency index: $Stringency_tercile_{i,t}$, $Stringency_median_adjusted_{i,t}$ and $Stringency_stadardised_{i,t}$. We created $Stringency\ tercile_{i,t}$ by splitting the *Stringency_index* into three categories of top, medium, and bottom levels corresponding to the three levels of strictness: below average, average, and above average. $Stringency_median_adjusted_{i,t}$ is a country's stringency index adjusted by all the countries' median levels of the index on a day *t*. $Stringency_stadardised_{i,t}$ is a normalised value of *Stringency_index*.

The control variables are *Ln_Population, Population_Density Ln_Gdp_Per_Capita, Ln_Median_Age, Aged_65_older, Length_quarantine, Hospital_Beds_Per_100k and Ln_Cvd_Death_Rate.* The definition of the variables are provided in the Appendix to this chapter.. Table 1 on the next page describes the descriptive statistics of the main variables, all continuous variables were winsorized at 1% and 99%.

Government Stringency Measure and the COVID-19 Spread

We constructed the following regression model to assess the effect of government stringency on COVID-19 spread:

$$Cases_grow_{i,t}=\alpha+\beta_1 Stringency_index_{i,t}+\beta_2 LN_population_{i,t}+\beta_3 Population_density_{i,t}+\beta_4 LN_GDP_per_Capita_{i,t}+\beta_5 LN_median_age_{i,t}+\beta_6 Lenght_quarantine_{i,t}+\beta_7 Hospital_beds_1000_{i,t}+\beta_8 LN_cvd_death_rate_{i,t}+Week\ fixed\text{-}effects+Country\ fixed\text{-}effects$$

We ran an OLS regression for four stringency indices controlling for week fixed-effects and country fixed-effects; standard errors were clustered at the country level. As shown in Table 2, all four measures of government stringency have negative and significant coefficients (for all four coefficients *p*-value is less than *0.01)*.

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY

Table 1. Descriptive Statistics

	N	Mean	St.Dev	min	p25	Median	p75	max
Cases_grow	10,666	.08	.62	-1	-.17	-.03	.14	8
New_cases	10,666	11,814.07	34,516.54	1	465	1957	7,287	527,487
Stringency_index	10,666	50.66	16.4	11.11	39.81	50	63.43	96.3
Stringency_tercile	10,666	1.97	.83	1	1	2	3	3
Stringency_median_adj	10,666	.04	1	-2.37	-.62	0	.82	2.82
Stringency_standardised	10,666	.46	.19	0	.34	.46	.61	1
Ln_population	10,666	16.55	1.84	10.58	15.41	16.16	17.75	21.09
Population_density	10,666	538.34	2,379.43	3	43	99	206	26,337
Ln_GDP_per_capita	10,666	10.15	.7	8.39	9.6	10.24	10.69	11.5
Ln_median_age	10,666	3.58	.21	3.04	3.44	3.62	3.77	4.01
Aged_65_older	10,666	13.45	7.04	0	6.74	14.41	20.16	28.4
Length_quarantine	10,666	8.59	3	0	7	8	10	14
Hospital_beds_1000	10,666	3.44	2.23	.04	1.7	3.1	5.46	9.26
Ln_cvd_death_rate	10,666	6.57	1.42	1.17	6.06	6.86	7.62	8.75

The results of the regression show that more stringent policies are associated with a slower COVID-19 spread. Particularly, Stringency_index has β=-0.002 (p=0.000). Hence, for every increase in standard deviation of Stringency_index (σ=16.4), the COVID-19 spread decreased by 3.28%. Since the average value of New_cases is 11,814.07, which corresponds to 387 fewer cases per day.

For *Stringency_tercile* the *β* coefficient was *-0.020 (p=0.000)*, which means that for every level increase of government stringency (from 'below average' to 'average', from 'average' to 'above average'), the spread of COVID-19 was decreasing by 32.8%, which is equal to 3,870 fewer COVID-19 cases daily. The results were consistent for *Stringency_standartised* and *Stringency_median_adjusted*.

As for the control variables, *Length_of_quarantine* coefficient was negative and significant (*b = -0.063, p=0.037)* for each of the four regressions, meaning that longer quarantine is associated with a slower growth rate of the new virus cases. In particular, one more day in quarantine decreases the spread rate of the virus by 18,9%, which equals to 2,232 fewer new cases per day. The results were consistent for *Stringency_standardised* and *Stringency_median_adjusted*.

Table 2. Regression Results

Cases Grow	(1)	(2)	(3)	(4)
Stringency_index	-0.002***			
	(0.000)			
Stringency_tercile		-0.020**		
		(0.008)		
Stringency_standardised			-0.133***	
			(0.038)	
Stringency_median_adjusted				-0.026***
				(0.007)
Population_density	0.000	0.000	0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.001)
LN_GDP_per_capita	-0.050***	-0.048***	-0.050***	-0.050***
	(0.011)	(0.011)	(0.011)	(0.011)
LN_median_age	0.568	0.244	0.568	0.568
	(0.684)	(0.677)	(0.684)	(0.684)
Aged_65_older	-0.006	-0.009	-0.006	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)
Length_quarantine	-0.063*	-0.064*	-0.063*	-0.063*
	(0.037)	(0.037)	(0.037)	(0.037)
Hospital_beds_1000	-0.013	-0.014	-0.013	-0.013
	(0.023)	(0.023)	(0.023)	(0.023)
LN_cvd_death_rate	-0.018	-0.022	-0.018	-0.018
	(0.042)	(0.043)	(0.042)	(0.042)
				(0.007)
Constant	0.330	1.602	0.312	0.251
	(2.716)	(2.716)	(2.716)	(2.719)
Week fixed-effects	Yes	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes	Yes
Obs.	10666	10666	10666	10666
R-squared	0.033	0.033	0.033	0.033

Standard errors are in parenthesis

**** p<0.01, ** p<0.05, * p<0.1*

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY

Eight Components of Stringency Index and the COVID-19 Spread

Our analysis so far was based on a composite index of government stringency, which consists of eight components ranked on an ordinal scale from 0 to 4 (4 being the strictest measure). The eight indicators are: 1) closure of schools and universities, 2) closure of public transport, 3) restrictions on private gathering, 4) restrictions on internal movements, 5) workplace closures, 6) cancellation of public events, 7) international travel controls, 8) stay-at-home requirements. Table A (in the Appendix) suggests the descriptive statistics of the main components of the analysis, and Table B (Appendix) illustrates the scale of the eight indices. It is worth noting that the number of observations differs for the variables since the data on the components of stringency were not available for each day of the period from 1 September 2021 to 20 April 2022.

Table 3 illustrates the results for regression of the growth rate of the virus *Cases_grow* on the eight components of stringency with the same control variables as for the original regression. We observe that all the components of the containment measures have negative coefficients, and only four are statistically significant: restrictions on gatherings, workplace closures, cancellation of public events, and stay-at-home requirements. The results for each of the four measures are discussed below.

The β for *Restriction_on_gatherings is -0.011 (p=0.04),* implying that for one level of increase of strictness on that measure (from 'no restrictions' to 'restrictions on very large gatherings', from 'restrictions on very large gatherings' to 'restrictions on gatherings between 101-1,000 people' and so on), the growth rate of new cases decreases by 1.1%. This equals to 130 fewer new cases per day.

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Workplace_closure is negatively and significantly correlated with *Cases_grow*, with β=-0.022 (p=0.006), hence an escalation of measures by one level (from 'no measures' to 'recommend closing', from 'recommend closing' to 'require closing for some categories of

Table 3. Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
School_closure	-0.004								0.005
	(0.008)								(0.009)
Close_public_transport		-0.011							-0.002
		(0.014)							(0.014)
Restrictions_gathering			-0.011**						-0.006
			(0.004)						(0.006)
Restrictions_internal_movement				-0.008					-0.001
				(0.010)					(0.010)
Workplace_closures					-0.022***				-0.015**
					(0.006)				(0.007)
Cancel_public_events						-0.022**			-0.006
						(0.010)			(0.015)
International_travel_controls							-0.005		-0.001
							(0.006)		(0.007)
Sta_home_requirements								-0.017**	-0.014**
								(0.006)	(0.007)
	(0.011)	(0.012)	(0.011)	(0.013)	(0.011)	(0.012)	(0.011)	(0.011)	(0.013)
LN_median_age	0.086	0.173	0.215	0.080	0.244	0.382	0.128	0.000	0.323
	(0.671)	(0.717)	(0.699)	(0.701)	(0.686)	(0.742)	(0.672)	(0.699)	(0.727)
Aged_65_older	-0.010	-0.009	-0.009	-0.010	-0.008	-0.008	-0.009	-0.010	-0.007
	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Length_quarantine	-0.063*	-0.063*	-0.063*	-0.063*	-0.062*	-0.063*	-0.063*	-0.063*	-0.062*
	(0.037)	(0.036)	(0.037)	(0.036)	(0.036)	(0.037)	(0.036)	(0.037)	(0.036)
Hospital_beds_1000	-0.015	-0.015	-0.014	-0.015	-0.016	-0.013	-0.015	-0.016	-0.015
	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)	(0.022)
LN_cvd_death_rate	-0.029	-0.029	-0.027	-0.029	-0.028	-0.022	-0.030	-0.028	-0.024
	(0.044)	(0.045)	(0.044)	(0.046)	(0.044)	(0.046)	(0.045)	(0.045)	(0.046)
Constant	2.214	1.693	1.796	2.128	1.536	1.003	1.932	2.778	1.431
	(2.702)	(2.845)	(2.798)	(2.813)	(2.730)	(2.976)	(2.675)	(2.785)	(2.913)
Obs.	10837	10837	10837	10836	10837	10837	10845	10836	10836
R-squared	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.035

Standard errors are in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY

workers' and from 'require closing for some categories of workers' up to 'require closing for all-but-essential workers') decreases the spread of the virus by 2.2%, which equals to 260 fewer new cases daily.

As reported in column 6, *cancellation_of_public_events* has also been associated with lower spread of the virus. The coefficient is β=-0.022 with p-value=0.006, which means that for every increase in the level of restrictions on the indicator, the spread of the virus decreases by 2.2%, that is 260 fewer new cases daily.

Stay-at-home requirements in column 8 are also associated with lower spread of the virus; in particular, they decrease the spread rate by 1.7%. Hence, holding everything else constant, one level escalation of the stay-at-home policy (from 'no measures' to 'recommended to stay at home', from 'recommended to stay at home' to 'required not leaving with exceptions for daily exercise and grocery', and up to 'require not leaving the house with minimal exceptions (e.g. allowed to leave once per week) slows down the growth of new cases by 200 cases daily.

Column 9 reports the regression results for all eight parameters simultaneously. The finding is that eventually two variables, namely Workplace_closure and Stay_at_home_requirement dominated. These results demonstrate that these two policies are the most important in tackling the growth rate of COVID-19 cases.

Cultural Tightness vs. Looseness and the COVID-19 Spread

In this section, we analyse the effect of one dimension of culture: cultural tightness vs. looseness on the growth rate of COVID-19 cases. The detailed explanation of these cultural aspects were provided in the previous chapter. To summarise, countries with tight cultures tend to strictly enforce rules and punish for deviant behaviours whereas in loose cultures, people have more freedom in their actions and beliefs. To investigate the effect of being in a culturally tight or loose country, we divided our sample into two categories: loose and tight. Initially, the parameter *Cultural_tightness_looseness* was distributed between a minimum of 0 and a maximum of

Table 4. Regression Results

Cases Grow	(1) Loose	(2) Tight
Stringency_index	-0.001	-0.002***
	(0.275)	(0.002)
Ln_population	-0.013	-0.047*
	(0.025)	(0.024)
Population_density	-0.012***	-0.000
	(0.001)	(0.000)
LN_GDP_per_capita	-0.806**	-0.066***
	(0.362)	(0.015)
LN_median_age	-6.990	-0.664**
	(14.668)	(0.248)
Aged_65_older	0.227	0.016***
	(0.430)	(0.004)
Length_quarantine	-0.134***	0.054***
	(0.004)	(0.019)
Hospital_beds_1000	0.260	-0.050***
	(0.221)	(0.011)
LN_cvd_death_rate	0.032	-0.032
	(0.029)	(0.021)
Constant	31.413	3.703***
	(49.938)	(1.068)
Week fixed-effects	Yes	Yes
Country fixed-effects	Yes	Yes
Obs.	2479	3189
R-squared	0.034	0.025

Standard errors are in parenthesis
**** p<0.01, ** p<0.05, * p<0.1*

111.8 (the loosest), with a mean of 46.6. After normalising the parameter, we used a 30% and 60% quantiles as a cut-off to classify a country as tight (below 30%) or loose (above 60%).

The *tight group* includes Albania, Algeria, Azerbaijan, Bahrain, Bangladesh, Brunei, Cambodia, Egypt, Gabon, Indonesia, Iran, Jordan, Kuwait, Libya, Malta, Morocco, Oman, Pakistan, Saudi Arabia, Tunisia, UAE, and Vietnam. The *loose group* includes Argentina, Australia, Austria, Belgium, Canada, Colombia, Costa Rica, Czech Republic, Denmark, Finland, Germany, India, Mexico, Norway, Slovakia, Slovenia, and Spain.

After separating loose and tight countries, we ran the original regression for the two groups; the results are reported in Table 5. The coefficient for the tight group is -0.002 and is statistically significant with p-value of 0.002 whereas the loose group had a coefficient of -0.001 (though statistically insignificant).

As we can see, in tight cultures, strict government containment policies have twice stronger negative effects on the spread of the virus compared to loose cultures. Thereby, imposing strict containment measures to slow the spread of COVID-19 is more effective in countries with tight cultures.

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY (APPENDIX)

Table A. Descriptive Statistics

	N	Mean	St.Dev	min	p25	Median	p75	max
Cases_grow	10,846	.08	.63	-1	-.17	-.03	.14	8
School_closures	10,837	1.23	.81	0	1	1	2	3
Close_public_transport	10,837	.53	.69	0	0	0	1	2
Restriction_gatherings	10,837	2.67	1.39	0	2	3	4	4
Restrictions_internal movements	10,836	.77	.92	0	0	0	2	2
Workplace_closures	10,837	1.57	.81	0	1	2	2	3
Cancel_public_events	10,837	1.48	.68	0	1	2	2	2
International_travel_controls	10,845	2.35	.9	0	2	2	3	4
Stay_home_requirements	10,836	.68	.85	0	0	0	1	3
Ln_population	10,846	16.55	1.85	10.58	15.41	16.16	17.75	21.09
Population_density	10,846	539.57	2387.01	3	43	99	206	26337
Ln_GDP_per_capita	10,846	10.15	.7	8.39	9.6	10.24	10.69	11.5
Ln_median_age	10,846	3.58	.21	3.04	3.44	3.62	3.77	4.01
Aged_65_older	10,846	13.44	7.03	0	6.74	14.41	20.16	28.4
Length_quarantine	10,846	8.57	2.99	0	7	8	10	14
Hospital_beds_1000	10,846	3.44	2.23	.04	1.7	3.1	5.46	9.26
Ln_cvd_death_rate	10,846	6.58	1.42	1.17	6.06	6.87	7.63	8.76

KEY DETERMINANTS FOR EFFECTIVE CONTAINMENT POLICY (APPENDIX)

Table B. Stringency Components Scale Description

Variable	Description	Measurement	Coding
School_Closures	Record closings of schools and universities	Ordinal scale	0—no measures 1—recommend closing 2—require closing (only some levels or categories, e.g. only high school or just public schools)
Close_public_transport	Record closing of public transport	Ordinal scale	0—no measures 1—recommend closing (or significantly reducing volume/route/means of transport available) 2—require closing (or prohibit most citizens from using it)
Restriction_gatherings	Record limits on private gatherings	Ordinal scale	0—no restrictions 1—restrictions on very large gatherings (the limit is above 1,000 people) 2—restrictions on gatherings between 101–1,000 people) 3—restrictions on gatherings between 11–100 people 4—restrictions on gatherings of 10 people or fewer
Restrictions_internal _movements	Record restrictions on internal movement between cities/regions	Ordinal scale	0—no measures 1—recommend not to travel between regions/cities 2—internal movement restrictions in place
Workplace_losures	Record closings of workplaces	Ordinal scale	0—no measures 1—recommend closing (or recommend work from home) 2—require closing (or work from home) for some sectors 3—require closing (or work from home) for all-but-essential workplaces (e.g. grocery stores, doctors)
Cancel_public_events	Record canceling public events	Ordinal scale	0—no measures 1—recommend canceling 2—require canceling
International_travel_controls	Record restrictions on international travel for foreign travelers, not citizens	Ordinal scale	0—no restrictions 1—screening arrivals 2—quarantine arrivals from some or all regions 3—ban arrivals from some regions 4—ban on all regions or total border closure
Stay_home_requirements	Record orders to 'shelter-in-place' and otherwise confined to the home	Ordinal scale	0—no measures 1—recommend not leaving the house 2—require not leaving the house with exceptions for daily exercise, grocery shopping, and 'essential' trips 3—require not leaving the house with minimal exceptions (e.g. allowed to leave once a week or only one person can leave at a time, etc.)

GOVERNMENT EFFICIENCY - TAKEAWAYS AND RECOMMENDATIONS

Table 1A

Takeaways	Recommendations
50% of cities did not respond promptly to the threat	• Conduct system capacity evaluation: define the roles and mechanisms of entities responsible for health systems strengthening in the emergency setting. • In the long term, national policies should emphasise improving resilience of health systems by addressing high risk areas, infrastructure vulnerabilities, and delivering essential services in all disruptive contexts.
51% of the cities have lower levels of trust in government	• Improve accountability and transparency of government institutions and their ability to meet expectations of citizens as this is fundamental to spawn public trust. • Strategies such as dynamic consent, digital literacy improvement, data technologies regulation, and the appointment of oversight institutions can be incorporated to avoid crippling public backlash by legitimating anti-epidemic technologies.
62% of the cities implement advanced technologies in some way	• Technology management policies and strategies should be formulated by the cities' governments. • Social media, monitoring systems, telemedicine, and contract tracing applications, pursued by various public, private actors, and governments, should be integrated in the city through promoting integrated digitalisation policy.
89% of the cities use technologies for surveillance practice but not on a full scale	• As cities implement surveillance practices such as case detection, contact tracing, and testing, the data collection and infrastructure analysis should be strengthened to provide additional support for the decision-making in case of further crises. • Thus, building trust in the surveillance technology itself that is reliable and effective is crucial to gain citizens' compliance when it comes to restrictive regulations, especially in democratic states.
44% of municipalities have observed a decrease in community satisfaction with governance during the pandemic	Extra focus is needed to maintain delivery of essential health services at local levels, including primary healthcare and community-based services through effective participation of local stakeholders: civil society, communities, both for-profit and nonprofit private sector must be considered.
On average, 10% of citizens do not have access to the internet	• Commit to keep all citizens connected by securing free access and connectivity in times of crisis. This can be done through solidarity plans and national connectivity guarantees (late fee waivers, providing services for those behind on bills). • Make use of available funds and resources to solve urgent access gaps and lack of devices.

Economic Resilience - TAKEAWAYS AND RECOMMENDATIONS

Table 1B

Takeaways	Recommendations
40% of the cities did not develop an emergency response mechanism that involved local communities and business	• Cities should commit to collect necessary information/data about local business needs and conditions. • Rules and regulations must be adapted by the city governments to ensure that businesses stay afloat during the crisis. • Cities should focus on creating strong ties with civil society, SMEs, and communities by engaging them in decision-making and recovery plans.
50% of the cities prepared well-thought-out plans of economic support for citizens and business	• Short-time work allowance schemes that help companies adapt to reduced demand and support income of the household, tax deferrals, and public loan guarantees for companies that have been affected the most by the pandemic are some examples of such measures. • Develop post COVID-19 recovery plans focused on economic resilience and sustainability.
20% of cities heavily rely on tourism flow	• Appropriate economic diversification strategies need to be developed and implemented. • Traditional economic activities should be strengthened. • New strategies, products, and innovative business models for their tourism industry should be adapted.
59% of the cities have been resilient enough not to feel the severe shock from the pandemic	• To develop urban economic resilience plans, fully integrated with other socioeconomic, urban planning and environmental actions, using legislative, technical, and financial support of national governments. • Monitoring and evaluation of urban economic resilience policies and decisions need to be in place to assess risks and plan for future scenarios.
49% of the cities have more than 15% of population below the poverty line	• Digitalise and improve social services by centralising data management systems for vulnerable households and individuals; • Ensure inclusion of vulnerable groups in policy responses to guarantee access to all public services; • Improve accountability of support systems by maintaining checks and balances and publicising necessary information.
The unemployment rate for 64% of the cities was above 5% of the total labour force during the pandemic	• Continue promoting increased usage of technology for remote work and business transactions. • Provide appropriate private and public investment in sectors hit hardest by the crisis such as tourism, transport, art, some parts of retail, care economy due to their capacity to provide more jobs. • Procure incentives to employers to retain workers during crisis such as shorter working weeks, targeted wage subsidies, etc.

CULTURAL COMPLIANCE – TAKEAWAYS AND RECOMMENDATIONS

Table 1C

Takeaways	Recommendations
In 32% of countries, individualism index is higher than the average	• In case of individualistic tendencies rooted in society, it is suggested to emphasise the individual benefits of safe conduct instead of promoting collectivistic social responsibility. • Thus, providing incentives such as unemployment benefits, basic necessities subsidies in this scenario will help demonstrate that such mitigation practices to support welfare of society is not in vain.
In 68% of countries, societies are embedded with collectivist values where people are used to take responsibility for one another's well-being	To promote safe behaviour during pandemic, policy and messages should be formulated based on collectivist nature, e.g. speak to one's responsibility for the community, people's sense of societal integrity and collective welfare.
In 44% of countries, cultures are loose, which have weaker norms and are more permissive	• Loose cultures must be adapted to the norms imposed in tight societies during the crisis. Governments must be proactive and negotiate the norms, making them more tight or loose, depending on the level of the threat during the crisis. • In this case, citizens enjoy more freedom in general and are more likely to disobey 'tight' regulations. Respectively, interventions might need to focus on clear and consistent risk communication from the government and stakeholders.
57% of countries are indulgent, meaning people generally exhibit a willingness to fulfil their impulses and desires	• Authorities should communicate clearly about serious risks from the threat to citizens. • It is suggested not to overstress rule violations as it might reinforce negative social tension in indulgent societies, which could lead to further violation of rules.
In 31% of countries, the cultural dimension of power distance is low	• Consultative form of leadership is more preferable, with policies focused on providing the right tools for citizens to make decisions. • Promoting knowledge from previous pandemics, factual and precise information about the crisis with support from NGOs, media, public service agents as well as engaging with public might provide more compliance from citizens.
55% of countries have high uncertainty avoidance, e.g. prone to make life as predictable and controllable as possible	Transparent communication with sharing rational information is key as, due to rigid social structures, such societies are more likely to experience heightened anxiety and stress during a crisis. In turn, it might lead to information avoidance and heuristic decision-making in such states.

QUARANTINE MANAGEMENT – TAKEAWAYS AND RECOMMENDATIONS

Table 1D

Takeaways	Recommendations
45% of cities adopted enough measures to flatten the curve in an sufficient and timely manner	• Focus on national and local governments' capacity to migitage shocks, develop clear and transparent emergency plans. • Promote investments and advances in technology to provide GovTech solutions for urban infrastructure. • New public policies should be implemented, including a rigorous testing strategy that stops new variants from spreading while keeping borders open to human travel.
80% of cities have a high population density	• In case of infection outbreak, targeted emergency preparedness strategies should first be focused on high-density urban areas first. • The focus should be on types/conditions of density as well as equitable access to urban services to lessen risks and the burden of social distancing in highly dense areas.
49 out of 100 cities are vulnerable to to further threats as they were severely hit by the pandemic and previous shocks	• It remains crucial for the more vulnerable cities to develop emergency management plans. • Ensure that existing health facilities and equipment are in place for any infection outbreak, and identify and organize additional resources.
50% of cities have adopted strict containment policies	• The slowing effect of containment policies is stronger for densely populated and culturally tight countries, meaning governments need to implement such policies carefully in accordance with the social and cultural context. • However, many countries are now rolling back strict measures; and, while relying on vaccination only is insufficient, a new strategy that recognises and slows down the emergence of new variants and limits their spread is needed to avoid burden on the health systems.
54% of cities have prepared a thorough post-COVID strategy	• Adopt a coordinated cross-sectoral, whole-of-government, whole-of-society approach to emergency preparedness. • Re-consider the way public services (particularly healthcare services) are organised and financed at the local level, as well as the role of civil society and the private sector.

HEALTHCARE MANAGEMENT – TAKEAWAYS AND RECOMMENDATIONS

Table 1E

Takeaways	Recommendations
28% of cities still do not use advanced technologies in their healthcare practices	• Invest in digital innovative solutions for service delivery: telemedicine, EHR systems, diagnostic chatbots, disease pharmacies, etc. • Cooperate with the private sector more to help lower barriers for the implementation of digital technologies. • Establish an ecosystem that encourages digital health start-ups to drive innovative solutions and offerings.
57% of cities do not have sufficient resources to ensure a fully functioning healthcare system	• Continue to invest in primary healthcare systems to respond effectively to pandemics and disease outbreaks at the local level. • Review the resources of existing health facilities; identify and mobilize additional resources that can help prepare in anticipation of a surge in patient demand.
84% of cities have programmes for monitoring and supporting patients after having COVID-19	• Implement continuous pulse oximetry and heart rate monitoring for all hospitalised patients and ED patients, as continuous monitoring improves safety and reduces workload on clinical staff. • Provide social and financial support for long COVID patients. Long COVID can limit the ability to engage in work and social activities, as a result, experience stress;
About one-fifth of cities are taking action to treat long COVID symptoms	• Create service lines and protocols for selection and enrollment that match the patient's risks with a menu of types of monitoring and required oversight. • Improve the screening measures and data analysis and maintenance to understand how likely the patient – based on their health profile – is to suffer from the symptoms of long COVID. This could provide enhanced measures of protection and support an individual risk profile.
50% of cities have an aging population (more than 14% of the city's population is aged 65 or above)	• The elderly are disproportionately vulnerable; health systems must prepare for greater care needs, considering the population's age structure and chronic disease profile. • Loneliness and other mental health issues are common among the elderly; COVID-19-driven physical distancing measures have unique and disproportionate impacts on older adults. Health and social support systems must anticipate these needs and respond.
19% of cities have a high rate of COVID-19 vulnerable health conditions	• Protect people with chronic illnesses and ensure timely non-COVID medical care. • During epidemics, separate health facilities for responding to infectious disease and non-infectious healthcare. • Invest in research about the implications of pharmaceutical interventions for the chronically ill.

VACCINATION RATE – TAKEAWAYS AND RECOMMENDATIONS

Table 1F

Takeaways	Recommendations
50% of countries have attempted to develop vaccines, and 46% are engaged in their own vaccine production	• Focus resources on the most promising vaccine candidates based on cross-disciplinary discussions when resources are strained during outbreaks of infection; improve transparency when doing so. • Strengthen the domestic vaccine R&D and production ecosystem; promote international collaboration. • Strengthen support for academia by ensuring basic research assets.
57% of cities have a sufficiently high vaccination rate	• Enhance collaboration between developers, industry, and regulatory and financial institutions while reducing barriers to vaccine development and ramping up local vaccine manufacturing capacity. • Reduce barriers to administering vaccines: tackle technical challenges related to data and storage infrastructure, vaccination schedules, and other logistic issues.
51% of studied populations trust the vaccines	• Improve communication strategies with regard to specific cultural contexts. • Communication strategy can be strengthened by implementing sentiment analysis. This helps monitor public attitudes towards taking a COVID-19 vaccine and helps to leverage trusted vaccine endorsers, especially scientists, experts, and other leaders.
50% of cities have weak local vaccination development and production capacities	• Establish contract manufacturing companies that will actively share knowledge, technology, and data with domestic manufacturers; also, develop distribution networks. • Support venture companies and similar organisations involved in innovative fields of R&D to speed up the production process.
40% of cities allocated their vaccines wisely	• Make sure to deploy a sufficient number of vaccination centres and services in urban areas and neighborhoods. • Consider population size and density, exposure, and vulnerability to a pandemic when designing a distribution mechanism. Elderly people and those with multiple pathologies are of special importance; so are regions where the population is poorly covered by health centres.
73% of cities actively use electronic immunisation systems to monitor vaccination coverage and gather related data for further investigation	Re-think the importance of digital tools for immunization registries – these can be used to register individuals and their vaccinations, send reminders, track people who fail to return for their next required dose, and monitor population-level uptake.

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Pandemic-Resilient Cities Ranking 2022

Methodology

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EXECUTIVE SUMMARY

Due to the dense populations, extensive transport networks, and high levels of economic activity in urban areas, cities have become the national epicentres of the pandemic, where transmission of infections has been amplified. This means that governments have increased responsibility for developing and maintaining strategies for pandemic preparedness, particularly in urban environments.

The safety of cities in modern conditions requires a review of the effectiveness of each city's emergency response system in the event of a crisis (in the most currently pertinent example, the global spread of COVID-19) and its pandemic preparedness strategies. The basis and information base for this evaluation is the result of the assessment of the city's efficiency, which involves the calculation and analysis of individual factors, and the definition of a comprehensive indicator that integrates all information about the results of the city. On top of five functional categories (comprehensive indicators) taken into consideration in previous iteration of the report series, which included Economic Resilience, Government Efficiency, Healthcare Management, Quarantine Efficiency, and Vaccination Rate, a sixth category, Cultural Compliance, was added. This category aims to provide insights on the distinct trajectories of countries' policies, shaped by the institutional arrangements, national cultural orientations, and the response of the population. These findings have important implications for public health policymakers, when implementing optimal measures to battle COVID-19 or similar pandemics in the future.

In order to evaluate cities' performance during the COVID-19 pandemic, from mid-2021 to spring 2022, this study employs a larger number of indicators and cities than in the previous iteration – 141 indicators versus 114 indicators; 100 cities versus 72 cities. Some indicators were changed: they were expanded and clarified. Some others lost their relevance and were replaced by more suitable ones for the period from September 2021 to mid-June 2022. The Ranking includes research for 100 major cities, including capitals as well as the cities with the largest economies. The focus of the analysis also shifted from the initial reactions and proactive response of the cities to the longer-term fight against the COVID-19 outbreak on a municipal level.

Behind the Ranking is an underlying data architecture that supports the measurement of municipal COVID-19 response and safety measures.

In addition to the municipal response to pandemics, the ranking examines a range of contextual factors. Thus, the indicator framework includes a set of indicators aimed at assessing the quality of municipal measures taken for:

- **Associated with the spread of COVID-19**
- **Appropriate approaches to public health measures and ensuring the continued provision of essential services**
- **Urban safety and resilience management strategy**
- **Vaccination policy and national strategy**
- **Coordination and coherence with national governments, society, the private sectors, and other stakeholders during emergencies**
- **Avoidance of the socioeconomic consequences of the pandemic**
- **Public policy measures addressing cultural norms and behavioural insights**

This publication is the second iteration of an ongoing and annually updated series of reports dedicated to municipal COVID-19 analytics. Deep Knowledge Analytics conducted a study of several cities that represent different political, socioeconomic and geographic backgrounds. This was done to assess the availability of data on the proposed questions as well as the value of the research results.

The indicator frameworks include both qualitative and quantitative indicators, framed as a binary choice (for qualitative data) or normalised (for quantitative data) in a range from 0 to 1, where higher scores represent better results. The data is obtained through open-data sources from national and local databases, non-governmental organisations, and local and international news media reports.

The analysis of the influence of any indicator or subsystem of indicators is based on a wide range of analytical methods that confirm the relationship of the selected criteria. In addition, the results were presented and discussed with a group of experts who provided their recommendations and helped to deepen the study of the health security conditions in a given city.

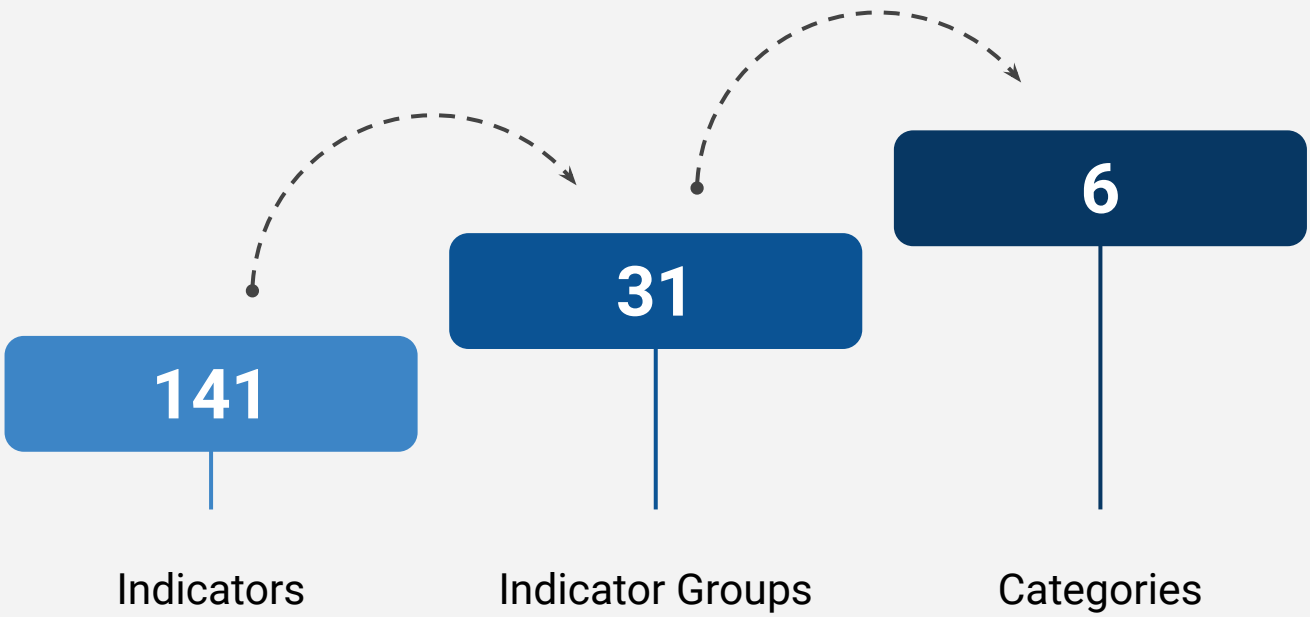
SCORING CATEGORIES AND INDICATORS

The Pandemic-Resilient Cities Ranking evaluates target cities in 6 municipal pandemic response functions (categories), and each of these functions comprises multiple indicator groups (31 in total), which in turn consist of several indicators. A total of 141 indicators are used in the ranking. The Ranking includes research for 100 cities, representing countries and cities with the largest economies and sufficient international recognition.

The normalised scores for each indicator within an indicator group are combined to calculate a city's function-specific rankings. The grouping was based on the correlation matrices and the opinions of experts. Each indicator group is calculated in such a way that the highest score is the most preferable.

Each category represents the number of normalised indicator groups multiplied by the corresponding weight of each group. The final score for each city is the sum of six equally weighted categories and ranges from 0 to 100.

The highest score does not indicate that the municipality has conducted the perfect response to the COVID-19 pandemic. Equally, the lowest score does not signify that a city has made no efforts to cope with the spread of the disease and its consequences. Instead, the score represents the relative efficiency of the municipal actions, where 0 indicates that actions lead to zero efficiency, while 100 represents a perfect response as measured by the Pandemic-Resilient Cities criteria.



THE SIX CATEGORIES ARE AS FOLLOWS:

1. **Government Efficiency:** *Rapid and sufficient government response to the spread of COVID-19.* Indicators of this category determine governance performance by local authorities and its involvement in public and international life; emergency response rapidness; e-readiness (integration of information and communication technology); surveillance practices for crime control and prevention; and societal satisfaction with government performance.

2. **Economic Resilience:** *Capacity of the economy to resist the global economic crisis due to COVID-19 and recover rapidly to the previous level of growth or higher*. This criterion measures the impact on the local economies due to the COVID-19 lockdowns and other precautions taken during the COVID-19 pandemic, as well as preventive actions by the authorities to stabilize the economy. In addition, the development of the local market and attractiveness for doing business is considered in order to evaluate the region's economic capacity. A wealth indicator group is used to estimate a hit on people's quality of life.

3. **Quarantine Efficiency:** *The effectiveness of the measures taken by the authority in order to cope with COVID-19 spread.* Indicators of this category evaluate urban preparedness for public health emergencies; COVID-19 Containment Policy and measures in order to prevent its spread, as well as the readiness of lockdown exit strategies; and attitudes towards COVID-19 lockdown among the general population.

4. **Healthcare Management:** *The resilience of the health system during the pandemic*. Indicators of this category assess health system capacity in hospitals; health information technology deployment for electronic surveillance and monitoring of the patients; population vulnerability; and public-health emergency management during the COVID-19 pandemic.

5. **Vaccination Rate:** *The distribution rate of safe and effective vaccines against COVID-19 among the population.* Indicators of this criteria evaluate the steps conducted by the governance to restrain disease spread by providing equal, secure conditions for citizens to vaccinate against COVID-19 infection. This is measured by assessing the COVID-19 vaccines' development and production, affordability, allocation, and deployment on the local level, as well as risk management for vaccination.

6. **Cultural Compliance:** *Classification of cultural factors that shape the degree of health-protective behaviour and compliance of citizens during the COVID-19 pandemic.* Indicators of this criteria evaluate cultural factors, Acceptance of Hierarchy, Degree of Social Interdependence, risk, uncertainty, and their links to endurance of hard times, strength of social norms, and tolerance of deviance.

Table 1A. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Government Efficiency		
Indicator Groups	***Indicators***	***Description***
E-Readiness	Smartphone Penetration	Percentage of the country or city population owning a smartphone.
	Internet Penetration	The share of the country or city population that has access to the internet.
	E-Government Development Index	Score of the country of the target city in the United Nations 'E-Government Development Index'.
Emergency Response Mechanism	Time to Any Lockdown From First Reported Case in China	The number of days from the first reported case in China to the government's response to prevent uncontrolled spread.
	Time to Any Lockdown From First Case In Reference Country	The number of days from the first case in the reference country to the government's response to prevent the spread.
	Containment Measures	The level of containment measures according to 'Our World in Data': No measures implemented = 1; Partial lockdown, i.e., physical distancing measures only = 2; Complete lockdown, i.e., enhanced containment measures including suspension of all nonessential services = 3; Curfew implemented, i.e., stay-at-home orders limited to specific hours. Implementation dates of these policies were used to determine the time from the first reported case to the implementation (in days) in each country. = 4.
	Travel Restrictions	The level of travel restrictions according to 'Our World in Data': Complete closure = 1; Partial = 0.5; Only with COVID-19 testing or quarantine = 0.
	International Travel Controls	The level of international travel controls during the COVID-19 pandemic according to 'Our World in Data': No measures = 0; Screening = 1; Quarantine from high-risk regions = 2; Ban on high-risk regions = 3; Total border closure = 4.
	Border Closure	The level of border closure measures on the local or national level: Complete closure =1; Partial closure = 0.5; No closure = 0.
Public Involvement	International Participation in Fighting COVID-19	The participation of the government in international anti-epidemic cooperation. Active participation (developing vaccines, supporting other countries and health organisations) = 1; Partial or latent involvement = 0.5; No participation = 0.
	Government–Start-Ups Cooperation	Cooperation of the government with start-ups in the fight against COVID-19: Yes = 1; No = 0.
	Trust in Government	The level of public trust in the government (% of respondents).
	Trust in Media	The level of public trust in the national media(% of respondents).
Satisfaction With Government Performance	Corruption Perceptions Index Score	The score of the country of the target city in the Transparency International 'Corruption Perceptions Index Score'.
	Civic Resistance	The presence of social instability, protests, or revolutions: Yes = 1; No = 0.
	Government Effectiveness	The score of the country of the target city in the Economist Intelligence Unit 'Government Effectiveness'.
	Functioning of Government	The score of the country of the target city in the Economist Intelligence Unit 'Functioning of Government'.
	Democracy Index	The score of the country of the target city in the Economist Intelligence Unit 'Democracy Index'.
Surveillance Practices	Quantity of Law Enforcement Officers	The number of law enforcement officers employed in the city.
	Quantity of Surveillance Cameras	The number of CCTV cameras installed in the city.
	Face-Recognition Technology for Surveillance	The use of face-recognition technology for surveillance practices in the city.
	Mobile Tracking	The tracking of the population's mobile phones at the national or domestic level.

Table 1B. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Economic Resilience		
Indicator Groups	***Indicators***	***Description***
Resilient Capacity in Times of Crisis	Fines for Violating The Quarantine Rules	The approximate amount of fines for noncompliance with quarantine rules, relative to GDP per capita (in US dollars).
	Economic Resilience	The degree to which a country's economy is dynamically resilient in the face of the pandemic by Horizon Group.
	Emergency Response Mechanism for Engagement With the Private Sector	Municipal or national actions in collaboration with the private sector to decrease economic harm during the pandemic crisis: Yes = 1; No = 0
	Absorptive Capacity	The degree to which the shock of COVID-19 can affect the economy of the country, as measured by Horizon Group.
Economic Impact of Reduction in Tourism	Tourism as % of Total Exports	Average tourism share of total export GDP for the target city for the last 5 years.
	Tourist Attractions	The number of tourist attractions listed on TripAdvisor with more than 100 reviews and located within 10 km of the target city's centre.
	Proximity to World Heritage Sites	Total points awarded based on the size and type of UNESCO World Heritage Sites located within 100 km of the centre of the target city.
	Number of Foreign Residents	The number of registered foreign residents without citizenship in the country of the target city.
	Number of Foreign Visitors	Annual number of foreign visitors to the target city.
Economy Rescue Package	Economic Support for the Health Sector	Financial support to the health sector during the COVID-19 pandemic (in US dollars).
	Healthcare Support as a Share Of GDP	Health expenditure as a percentage of gross domestic product during the COVID-19 pandemic.
	Economic Support for SMEs	Economic support packages for small and medium-sized enterprises during the COVID-19 pandemic (in US dollars).
	SME Support as a Share of GDP	Economic support packages for small and medium-sized enterprises as a percentage of gross domestic product during the COVID-19 pandemic.
	Income Support During the COVID-19 Pandemic	Economic support for people who lose their jobs or cannot work by covering their salaries or providing direct cash payments: No income support = 0; <50% coverage of lost salary = 1; >50% coverage of lost salary = 2.
Economy Vitality	Stock Market Returns	Stock market changes for the period from September 2021 to mid-June 2022 (in %).
	Change in Credit Agency Rating	Country credit rating, overall score. Range of credit rating from AAA = 1 to D = 0.1
	Economic Freedom	Score of the country of the target city in the Heritage Foundation's 'Index of Economic Freedom'.
	Stock Market Capitalisation	Aggregate domestic market capitalisation for the stock exchanges located in the target city from the World Federation of Exchanges 'Domestic Market Capitalisation' (in US dollars).
Market Attractiveness	GDP Growth Rate	Compound Annual Growth Rate (CAGR) of real GDP for the target city for the last 5 years (in %).
	Ease of Doing Business	An average of the 10 indicators related to ease of doing business for the target city or the country of the target city in the World Bank's 'Doing Business' index.
	Corporate Tax Rate	Corporate tax rate for the target city or the country of the target city.
	Volume of Exports	Aggregated measures of the volume of exports of individual countries on a constant price basis (in US dollars).
	GDP per Capita (Purchasing Power Parity)	GDP of the country of the target city converted to international dollars using purchasing power parity (PPP) rates (in US dollars).
	Gini Coefficient	The summary measure of the distribution of the income across a population of the country of the target city.
Wealth Indicator (Level of Inequality)	Human Development Index (HDI) Ranking	Score of the country of the target city in the United Nations HDI rankings.
	Unemployment Rate	Total unemployment rate in the target city (% of total labour force).
	Poverty Levels	National estimates of the percentage of the population falling below the poverty line.

Table 1C. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Quarantine Efficiency		
Indicator Groups	***Indicators***	***Description***
COVID-19 Detection	Number of COVID-19 Tests	Daily COVID tests in the country or city (per 1,000 people).
	Critical Cases	The number of critical cases in the city or country due to COVID-19.
	Critical Case Rate	The share of critical cases per total cases.
	Severity Index	The severity of the overall effects of COVID-19 from a health perspective on the country of the target city.
City Preparedness for Pandemics	Plan for COVID-19	Existing publicly available national or domestic plan in fighting against COVID: Yes = 1; No = 0.
	Local COVID-19 Test Production	Domestic production of COVID-19 tests: Yes = 1; No = 0.
	Population Density	Population density of the city (people per km^2).
	COVID-Related Training Courses	Existing COVID-related training courses for doctors and nurses in the city or country: Yes = 1; No = 0.
Stringency of Containment Policy	Length of Quarantine	Length of mandatory quarantine time for specific groups of people (number of days).
	Public Transport Closures	Measures for prohibiting public transport during the COVID-19 outbreak: No measures = 0; Recommend closing (or significantly reduce volume/route/means of transport available) = 1; Require closing (or prohibit most citizens from using it) = 2.
	Testing Policies	Policy for COVID-19 Tests: No testing policy = 0; Only those who both (a) have symptoms and also (b) meet specific criteria (e.g. key workers, admitted to hospital, came into contact with a known case, returned from overseas) = 1; Testing of anyone showing COVID-19 symptoms = 2; Open public testing (e.g. 'drive-through' testing available to asymptomatic people) = 3.
	Restrictions on Internal Movement	Restriction measures on internal movement during the COVID-19 pandemic: No measures = 0; Recommend movement restriction = 1; Restrict movement = 2.
	Face Coverings	Policies and requirements on face coverings: No policy = 0; Recommended = 1; Required in some specified shared/public spaces outside of the home with other people present, or some situations where social distancing is not possible = 2; Required in all shared/public spaces outside the home with other people present or all situations when social distancing not possible = 3; Required outside the home at all times regardless of location or presence of other people = 4.
	International Travel Controls	Level of international travel control measures: No measures = 0; Screening = 1; Quarantine arrivals from high-risk regions = 2; Ban on high-risk regions = 3; Total border closure = 4.
	Stringency Index	Score of the country of the target city in the Our World in Data 'Stringency Index'.
Post-COVID Strategy	Post-COVID Economy Recovery	Post Pandemic COVID-19 Economic Recovery: Yes = 1, No = 0.
	National Health Emergency Framework	The proportion/percentage of attributes (a set of specific elements or functions that reflect the level of performance or achievement of Core Capacity 1: national legislation, policy, and financing) that have been attained.
	Recovery Rating	Measures recovery rates, testing rates, and the country's overall ability to detect, treat, and respond effectively to disease.
	Recovery Index	Evaluation of the main recovery parameters that are being reported daily to give a clear indication of how a country is performing on its path to recovery in relative comparison to other countries.
Prevention of COVID-19 Spread	Recovery Rate	The share of people who have recovered from COVID-19.
	Doubling Time of Confirmed Deaths	The number of days taken for the number of total confirmed COVID-19 deaths to double.
	Total Cases per City	The number of COVID-19 cases per 1,000 people from September 2021 to mid-June 2022
	Active Cases	The number of active cases relative to the general population.
	Total Cases	The number of COVID-19 cases per 1,000 people from September 2021 to mid-June 2022

Table 1D. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Healthcare Management		
Indicator Groups	***Indicators***	***Description***
E-Health Score	Online Diagnostic Tools Usage	Level of usage of advanced technology in diagnostic practices: Yes = 1; No = 0.
	Use of Electronic Health Records	Existing Electronic Health Records system atn a domestic level: Yes = 1; No = 0.
	Healthcare Index	The score of the country of the target city in the Numbeo 'Health Care Index by City 2021.'
	Employment of AI Technologies And Techniques In Hospitals	Use of AI technologies and techniques in hospitals: Yes = 1; No = 0.
Health System Resources	Health System Capacity and Access	Composite index score of citizens' ability to access health services and availability of resources/inputs to deal with the variety of the patient/service mix.
	Hospital Beds	The number of hospital beds across hospitals in the city (per 1,000 citizens).
	Number of Doctors	The number of doctors for every 1,000 citizens in the city.
	Number of Nurses	The number of nurses for every 1,000 citizens in the city.
	Current Health Expenditure per Capita	Current health expenditure per capita (in US dollars).
	Health Expenditure	Healthcare expenditure as a % of GDP.
Healthcare COVID Response	Support for Patients for COVID-19 Recovery	Existing programmes for providing patient support during recovery from COVID-19: Yes = 1; No = 0.
	Proportional COVID Mortality Rate	Deaths caused by COVID as a % of total deaths during the period.
	COVID Mortality Rate	Deaths caused by COVID-19 as a % of the city population.
	Infection Fatality Ratio	The % of COVID-19 cases that result in death.
	Pandemic Preparedness	The capacity and preparedness of the country of the target city to respond effectively to pandemics.
	Health Resilience	The capacity to adapt to challenges and changes at different system levels and to maintain high-quality care
Population Vulnerability	Health Risk Factors	Composite index score of health risk factors that increase a person's chances of getting a disease or other health-related condition.
	Size of the Elderly Population	Number of people older than 65 years as a % of the total city population.
	Incidence of Tuberculosis	Incidence of tuberculosis in the city or country (per 100,000 people).
	Median Population Age	The median of the age distribution of the population.
	Incidence of Cancer	Incidence of cancer in the city or country (per 100,000 people).
Public Health	Diabetes Prevalence	Prevalence of diabetes as a % of the population aged 20-79
	Obesity Prevalence	Number of people with obesity as a % of the total population of the city or country.
	Adult Mortality Risk	The risk of death between the ages of 18 and 65 (cases per 1,000 people).
	Death Rate Due to Endocrine Disorder	Rate of death due to endocrine disorder (per 100,000 people).
	Disease Burden of Mental Health	The prevalence of mental health and substance use disorders (as a % of total disease burden).

Table 1E. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Vaccination Rate		
Indicator Groups	***Indicators***	***Description***
Affordability of COVID-19 Vaccines	COVID-19 Vaccination Policy	Government policies on COVID-19 vaccination delivery for different groups: Availability for ONE of the following: key workers/ clinically vulnerable groups / elderly groups = 1; Availability for TWO of the following: key workers/ clinically vulnerable groups / elderly groups = 2; Availability for ALL of the following: key workers/ clinically vulnerable groups / elderly groups = 3; Availability for all three plus partial additional availability (select broad groups/ages) = 4; Universal availability = 5.
	Optimal Vaccine Information for Consumers	Strategies and actions for increasing vaccine acceptance and demand on a national or local level: Existing programmes on state or domestic level = 1; There are no additional measures taken = 0.
	AI/MI Healthcare Initiatives Related To COVID-19	ML and AI approaches in healthcare systems for response to COVID-19.
	Existing Electronic Immunisation System	Usage of electronic immunisation system for monitoring COVID-19 vaccinations: Yes = 1; No = 0.
	National COVID-19 Vaccination Strategy	Existing national COVID-19 vaccination strategy: Yes = 1; No = 0.
Deployment of COVID-19 Vaccines	Fully Vaccinated Population	Share of people fully vaccinated.
	Vaccine Doses Administered	The total number of vaccine doses administered per 100 people in the total population.
	Booster or Additional Vaccination	Number of persons who have received a booster or additional dose per 100 people in the total population.
	COVID-19 Vaccine Acceptance Rate	Public confidence in the vaccine (in %).
	Time Since First Vaccination Administered	Share of the total population that have received all doses prescribed by the vaccination protocol.
	Number of Types of Vaccines Available	The number of vaccine options (e.g., Pfizer, Moderna, Oxford–AstraZeneca) that are available in the country.
Efficiency of Vaccine Allocation	Priority Groups for Vaccination	The number of phases to vaccinate prioritised target groups.
	Vaccination at Home	Availability of vaccination-at-home option: Yes = 1; No = 0.
	Drive-Through COVID Vaccination Service	Availability of drive-through COVID vaccination service: Yes = 1; No = 0.
	Number of Vaccination Centres In City	Number of special centres and services providing vaccination against COVID-19 in the city.
	Private Vaccination Centres	Number of private centres or hospitals providing COVID-19 vaccination.
Vaccine Production Capacity	Local Vaccine Development	Presence of development or attempts to develop vaccines in the city or country: Yes = 1; No = 0.
	Local Vaccine Production	COVID-19 vaccine production in the city or country: Yes = 1; No = 0.
	Number of Vaccine Developers	The number of vaccine developers in the country or city.
	Number of Patents	The number of patents related to COVID-19.
	Vaccine Manufacturing Capacity	The total number of COVID-19 vaccine doses produced in the country or city.

TABLE 1F. Pandemic-Resilient Cities Ranking Framework by Categories, Indicator Groups, and Indicators

Cultural Compliance		
Indicator Groups	***Indicators***	***Description***
Acceptance of Hierarchy	Power Distance Index	The extent to which the less powerful members of institutions and organisations within a country accept and expect that power is distributed unequally.
	Hierarchical Culture vs. Egalitarian Culture	A hierarchical society shows high levels of deference and respect to power and authority, whereas, in an egalitarian society, there is relatively equal access to income and wealth: Hierarchy = 1, Egalitarian = 0.
	Confidence in Government	The level of public trust in government (% of respondents).
Degree of Social Interdependence	Specific Orientations vs. Diffuse Orientations	Specific cultures are more frank and direct, using clear descriptive words and focusing on the facts. Diffuse cultures accept, understand, and prefer indirect communication that may carefully use contextual clues to convey understanding: Diffuse = 1; Specific = 0.
	Individualism Index	The degree of interdependence that a society maintains among its members.
	Masculinity Index	A more masculine society is driven by competition, achievement, and success, with success being defined by the winner/best in the field. In a less masculine (more feminine) society, the dominant values are caring for others and quality of life.
	Interpersonal Trust Index	Share of people agreeing with the statement 'Most people can be trusted'.
Risk, Uncertainty, and Their Links to Endurance During Challenging Times	Long-Term Orientation	The extent to which a society looks forward to the future rather than resorting to the past to solve the problems in the present or the future.
	Indulgence Index	The extent to which people try to control their desires and impulses, based on the way they were raised.
	Uncertainty Avoidance Index	The extent to which a society, organisation, or group relies on social norms, rules, and procedures to alleviate the unpredictability of future events.
	Survival Values vs Self-Expression Values	Cultures with survival values prioritise survival, due to their insecurity, while cultures with self-expression values prioritise free choice: Survival Values = 1; Self-Expression Values = 0.
Importance of Personal Freedom	Human Freedom Index	The level of human freedom in the country of the target city.
	Personal Freedom	Involves indicators such as the fairness of the laws, personal safety, freedom of movement and assembly, freedom of religion, freedom to run for political office, freedom of the press, freedom of speech and expression, and freedom to pursue same-sex relationships or obtain a divorce.
	Economic Freedom	Indicates general freedom to prosper financially without intervention from the government or economic authority.
	Social Progress Index	The extent to which countries provide for the social and environmental needs of their citizens.
Level of Prosperity and Life Opportunities	Legatum Prosperity Index	A ranking based on a variety of factors including wealth, economic growth, education, health, personal well-being, and quality of life.
	Happiness index	A comprehensive survey instrument that assesses happiness, well-being, and aspects of sustainability and resilience.
	Gender Gap Index	The state of gender equality of the given country in four key areas: health, education, economy, and politics.
	Freedom To Make Life Choices	The national average of binary responses to the Gallup World Poll (GWP) question 'Are you satisfied or dissatisfied with your freedom to choose what you do with your life?'
Strength of Social Norms	Clarity and Number of Social Norms	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income.
	Homicide Rate	The number of deaths per 100,000 head of population per year.
	Cultural Tightness or Looseness	Homogeneous cultures are tight, while heterogeneous cultures are loose. A tight culture does not allow for much variation in values and behaviour, whereas there is a considerable degree of latitude in loose cultures.

METHODOLOGY
GENERAL PART

The Pandemic-Resilient Cities Ranking comprises categories that are related to the municipal pandemic response of every targeted city. To score the indicators for the Ranking, the research team gathered data from the following sources:

- Primary legal texts and legal reports
- Government publications and reports
- Academic publications and reports
- Websites of government authorities, international organisations, and non-governmental organisations
- Local and international news media reports

The Pandemic-Resilient Cities Ranking assessed the performance of the following 100 cities, listed in alphabetical order in the table and shown on the map below:

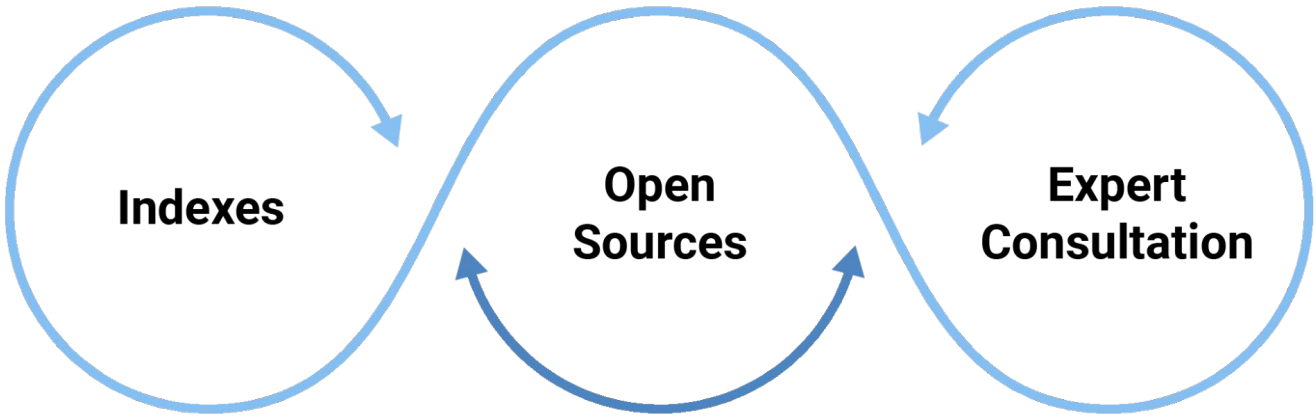
Abu Dhabi	Bucharest	Johannesburg	Muscat	Stockholm
Algiers	Budapest	Kuala Lumpur	New Delhi	Sydney
Almaty	Buenos Aires	Kuwait City	New York	Taipei
Amman	Cairo	Kyiv	Nicosia	Tallinn
Amsterdam	Canberra	Libreville	Oslo	Tbilisi
Ankara	Casablanca	Lima	Ottawa	Tehran
Athens	Chisinau	Limassol	Paris	Tel Aviv-Yafo
Auckland	Copenhagen	Lisbon	Phnom Penh	Tirana
Baghdad	Dhaka	Ljubljana	Port Louis	Tokyo
Baku	Doha	London	Prague	Toronto
Bandar Seri Begawan	Dubai	Los Angeles	Riga	Tripoli
Bangkok	Dublin	Madrid	Riyadh	Tunis
Barcelona	Gaborone	Manama	Rome	Valletta
Beijing	Hanoi	Manila	San José	Vienna
Belgrade	Helsinki	Mexico City	Santiago	Vilnius
Berlin	Hong Kong	Minsk	Sao Paulo	Warsaw
Bern	Islamabad	Monaco	Seoul	Wellington
Bogota	Istanbul	Montevideo	Shanghai	Yerevan
Bratislava	Jakarta	Moscow	Singapore	Zagreb
Brussels	Jerusalem	Mumbai	Sofia	Zurich

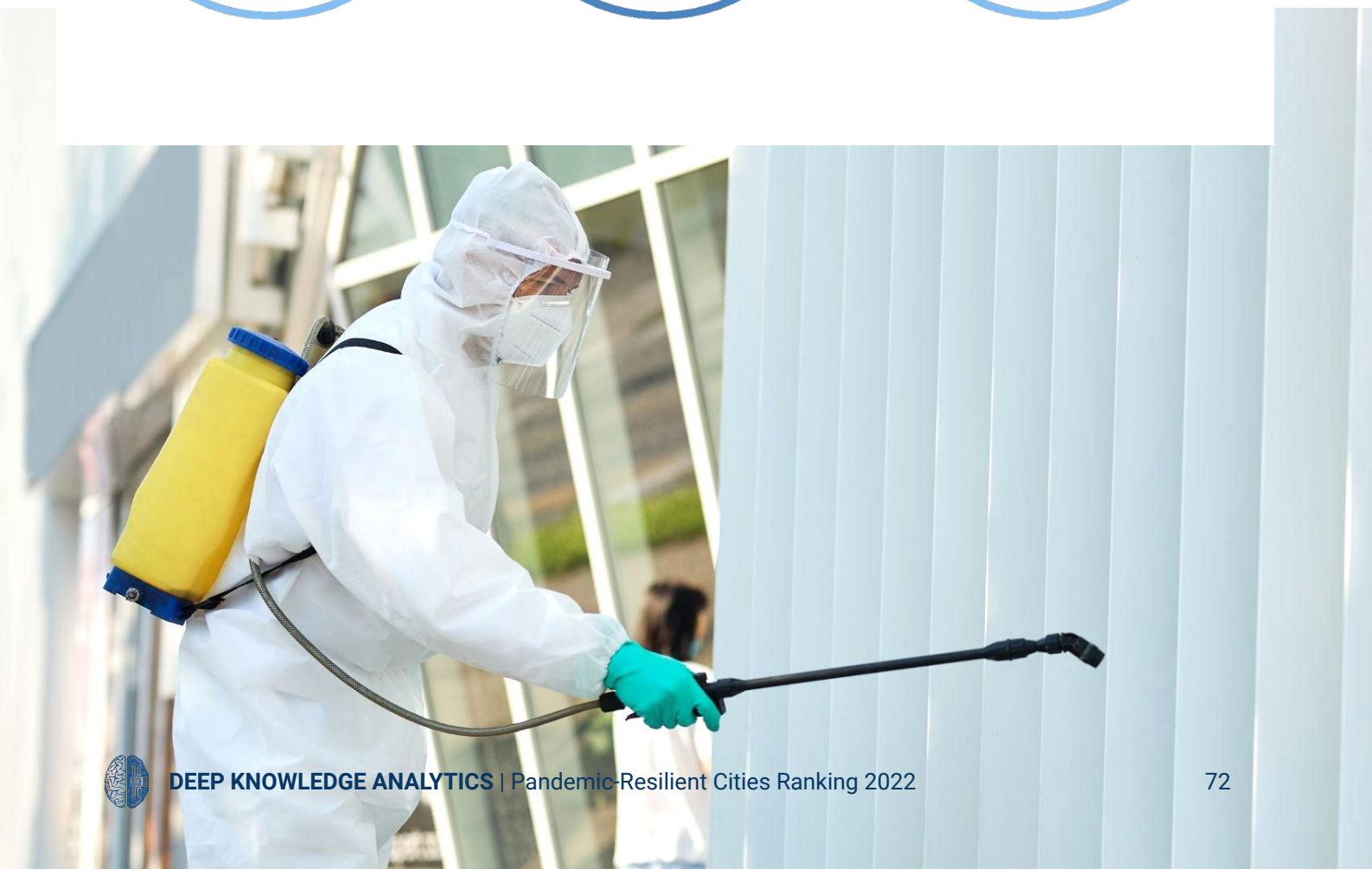
PANDEMIC-RESILIENT CITIES RANKING: DATA ACCURACY REVIEW AND VALIDATION PROCESS

The Pandemic-Resilient Cities Ranking comprises categories that are related to the municipal pandemic response of every targeted city. The ranking utilises a combination of publicly available databases (including but not limited to indexes and city statistics), as well as manually-curated and researched quantitative and qualitative data obtained by manual searches using search engines, media and governmental reports, and the use of expert opinions and consultations in cases where data was not available.

In utilising three qualitatively distinct sources of data, Deep Knowledge Group analysts have attempted to overcome barriers in conducting a robust and comprehensive, yet reliable and methodologically rigorous analysis by utilising the largest and most reputable databases (usually constructed by an unbiased and neutral international group or foundation) wherever possible. The analytic process also involves consulting region-specific resources when open-source international databases were not accessible, and utilising expert opinions in all cases where publicly accessible regional and/or international data sources were unavailable.

By utilising this approach, the present analysis attempts to find an optimal balance between using maximally transparent and reliable sources of data, and including data which is only obtainable from expert consultation.





PANDEMIC-RESILIENT CITIES RANKING: DATA MODELLING

To obtain readily understandable and consistent final scores, each indicator in all three layers of the framework (categories, indicator groups, and indicators) is assigned a specific weight, or an importance factor, designed to approximate the relative importance of each indicator on the effectiveness of a city's current situation, emergency response efforts, or post-pandemic preventive measures as it relates to the specific analytical focus and endpoint of its parent group (indicator group or category).

Each top-level qualitative metric category consists of a matrix of quantitative or qualitative indicators relating to the specific topic, analytical focus, and end-point of their indicator group. Quantitative indicators are numeric and are therefore obtained from a variety of reputable, publicly available sources of data. Qualitative indicators are binary, and cities are assigned either a 1 or a 0, which represents an answer to a specific yes or no question.

While the ranking takes into account both positive and negative factors impacting a given city's current or future (post-pandemic) stability, each score is constructed in such a way that a higher value is associated with more favourable and preferable conditions.

Deep Knowledge Group analysts first worked to formulate the specific list of parameters (categories, indicator groups, and indicators) and to assign relevant parameter weights (importance factors). Then, they gathered data from government and academic publications, websites of government authorities, international organisations, non-governmental organisations, and local and international news and media reports in order to compute the score for each parameter.

The list of indicators has changed slightly compared to the previous iteration due to new challenges and problems that arose from mid-2021 to April 2022. Additionally, some of the indicators were expanded as progress unfolded. The research process proved challenging because of the difficulty in sourcing data and official information related to each quantitative and qualitative indicator and, in some cases, due to a lack of publicly available information.

Model Weights					
Economic Resilience	Vaccination Rate	Government Efficiency	Healthcare Management	Cultural Compliance	Quarantine Efficiency

Model Weights

The framework consists of 6 top-level qualitative metric categories (Economic Resilience, Government Efficiency, Healthcare Management, Quarantine Efficiency, Vaccination Rate, Cultural Compliance).

Categories, indicator groups of each category, and indicators each have their own individual weight, as their importance and impact on the overall municipal state varies. The weights in the model are chosen as follows:

Expert Opinion: The first option, which is used for default weights, uses expert judgment to assign weights to indicators and brings an authoritative perspective to the ranking.

Neutral Weights: The second weighting option, neutral weights, assumes equal importance of all indicators and evenly distributes weights on that basis. This approach has the advantage of simplicity and does not involve subjective judgment. A disadvantage of this option is that it assumes that all indicators are equally significant.

Principal Component Analysis: A third weighting option is principal component analysis (PCA). PCA weights are obtained using a mathematical process that takes into account the covariance between indicators and the importance of a particular element to maximize variations in scores. It aims to minimise redundancy between variables and maximise variance within the ranking, but it does not take into account the perception of the importance of indicators.

PANDEMIC-RESILIENT CITIES RANKING: DATA MODELLING

1

Initially, an array of data and information was formed to assess the level of efficiency of the city. During the formation of the integrated score, indicators were selected by experts and distributed among the subsystems (categories and groups of indicators) to form an assessment of the effectiveness of the city in performing a specific function.

2

The next step was to determine the areas of influence of indicators on the level of efficiency of the city and bring them to a single comparable form, by dividing indicators into stimulators and de-stimulators. This was done on the principle that the relationship between the integrated assessment and the indicator-stimulator was direct, and with the indicator-destimulator this relationship was inverse.

3

The values of each indicator are normalised on the basis of the following equations:

For indicators-stimulators:

x = (x – Min(x))/(Max(x) – Min(x))

For indicators-destimulators:

x = (Max(x)-x)/(Max(x)-Min(x),

where Min(x) and Max(x) are the lowest and highest actual values, respectively, in the Pandemic-Resilient Cities Ranking for any given indicator.

4

Then, these normalised indicator values are multiplied on the corresponding weight of importance in the group and summed up to determine the value of their indicator group:

indicator score = ∑ weighted individual indicator parameters

(The process of determining the weights for criterias, indicator groups and indicators is described further in the **Model Weights** section.)

5

Then, the indicator score is multiplied by its weight in the category and summed up, representing the category score. Thus, the category values consist of a weighted total of the indicator values within each category:

category score = ∑ weighted category-specific indicator groups

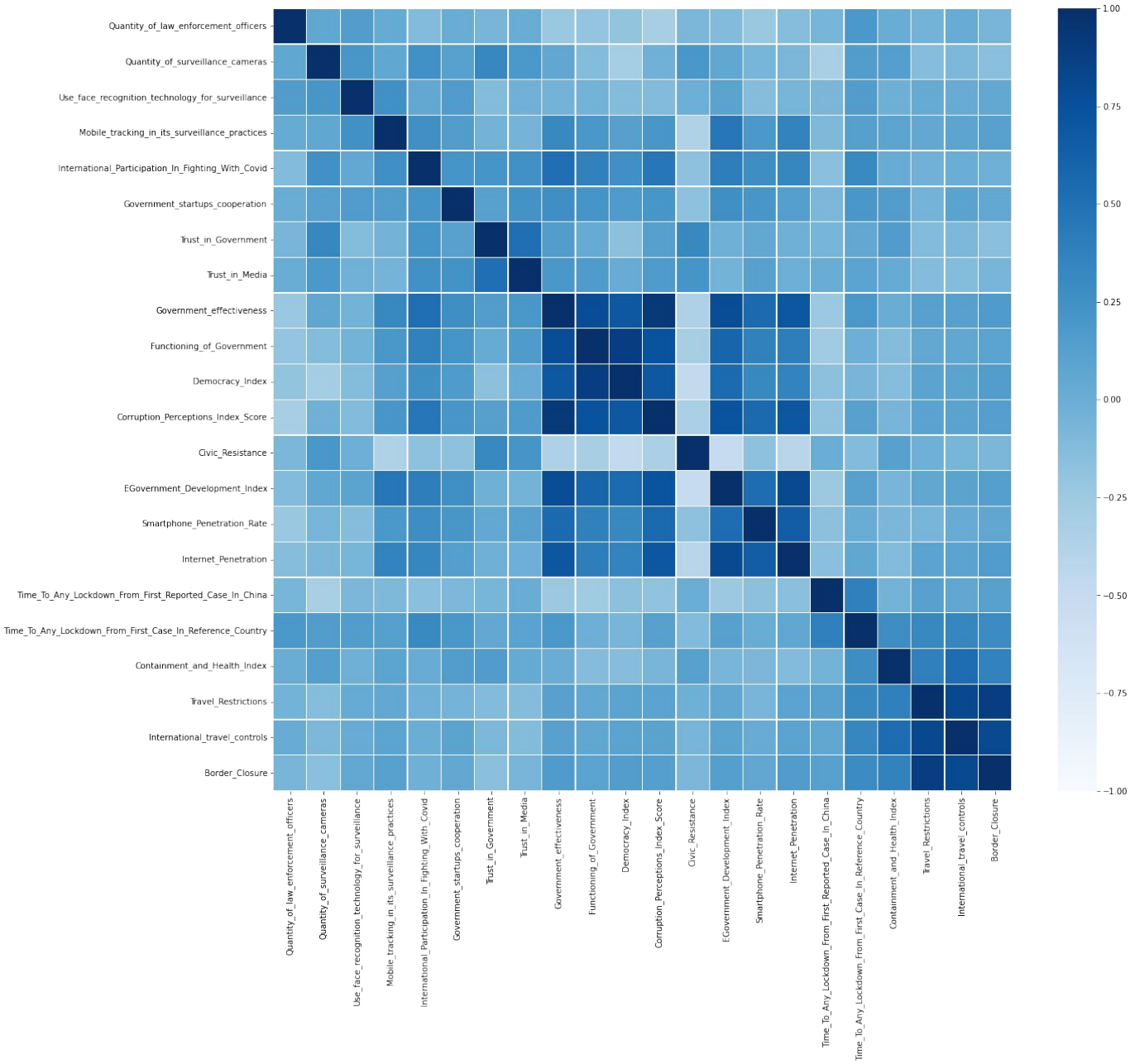
6

Finally, the cumulative ranking score for each city is obtained by summing equally weighted categories together.

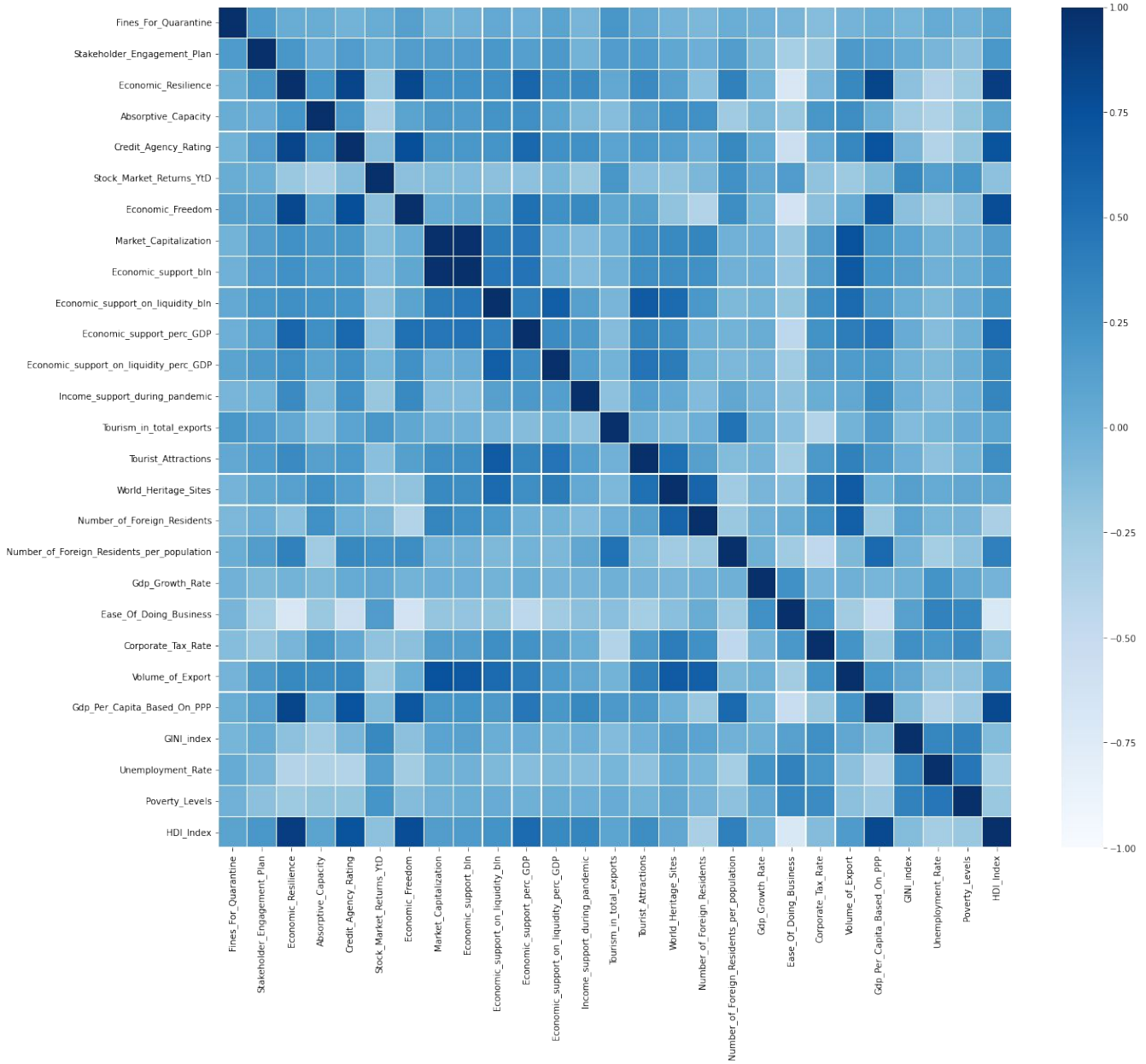
TABLE 2 : WEIGHT PROFILE BY INDICATOR GROUPS

	Category	Weighting factor
1	**Government Efficiency**	
1.1	E-Readiness	**22.84%**
1.2	Emergency Response Mechanism	**21.49%**
1.3	Public Involvement	**12.94%**
1.4	Satisfaction With Government Performance	**24.89%**
1.5	Surveillance Practices	**17.83%**
2	**Economic Resilience**	
2.1	Resilient Capacity in Times of Crisis	**18.39%**
2.2	Economic Resilience From Tourism Decline (%)	**18.42%**
2.3	Economy Rescue Package	**18.39%**
2.4	Economy Vitality	**18.41%**
2.5	Market Attractiveness	**11.75%**
2.6	Wealth Indicator (Level of Inequality)	**14.64%**
3	**Quarantine Efficiency**	
3.1	City Preparedness for Pandemics	**14.04%**
3.2	Stringency of Containment Policy	**22.34%**
3.3	COVID-19 Detection	**17.50%**
3.4	Post-COVID Strategy	**23.78%**
3.5	Prevention of COVID-19 Spread	**22.34%**
4	**Healthcare Management**	
4.1	E-Health Score	**12.91%**
4.2	Health System Resources	**22.53%**
4.3	Healthcare COVID Response	**19.55%**
4.4	Population Vulnerability	**22.53%**
4.5	Public Health	**22.49%**
5	**Vaccination Rate**	
5.1	Affordability of COVID-19 Vaccines	**21.11%**
5.2	Deployment of COVID-19 Vaccines	**31.66%**
5.3	Efficiency of Vaccine Allocation	**31.59%**
5.4	Vaccine Production Capacity	**15.63%**
6	**Cultural Compliance**	
6.1	Acceptance of Hierarchy	**20.56%**
6.2	Degree of Social Interdependence	**11.40%**
6.3	Risk, Uncertainty, and Their Links to Endurance During Challenging Times	**20.17%**
6.4	Importance of Personal Freedom	**17.24%**
6.5	Level of Prosperity and Life Opportunities	**16.01%**
6.6	Strength of Social Norms	**14.62%**

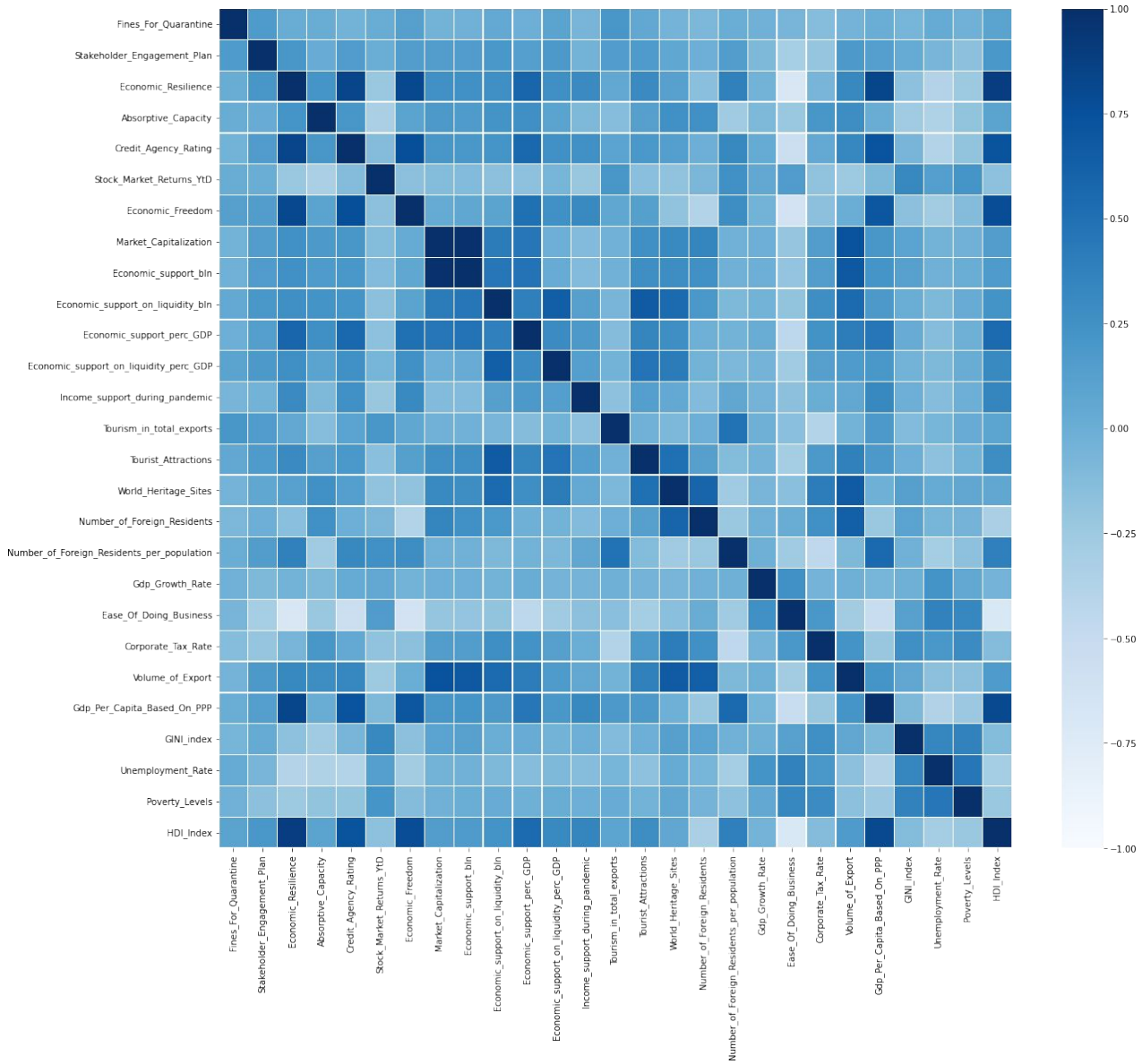
GOVERNMENT EFFICIENCY – CORRELATION MATRIX



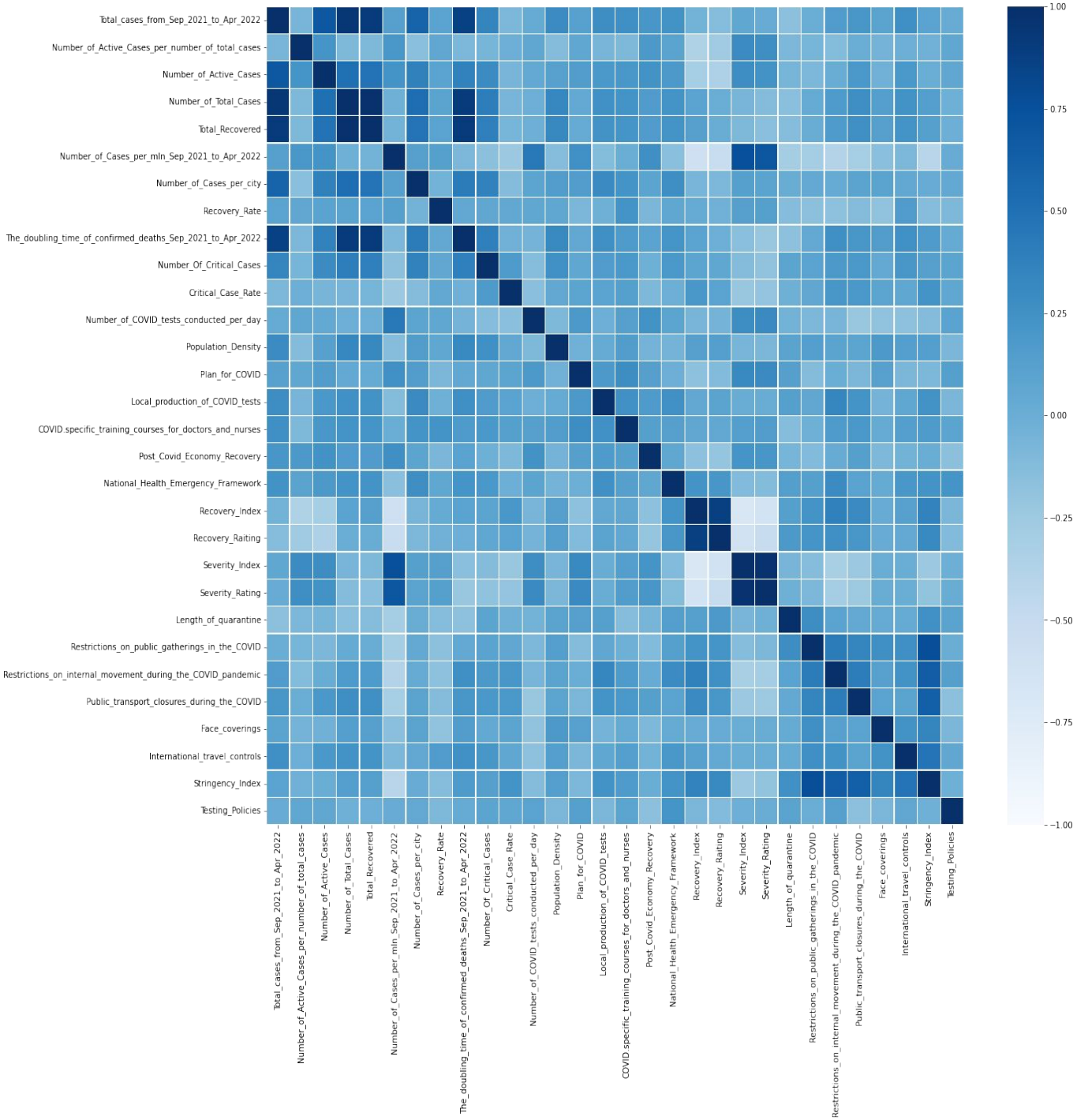
Economic Resilience – CORRELATION MATRIX



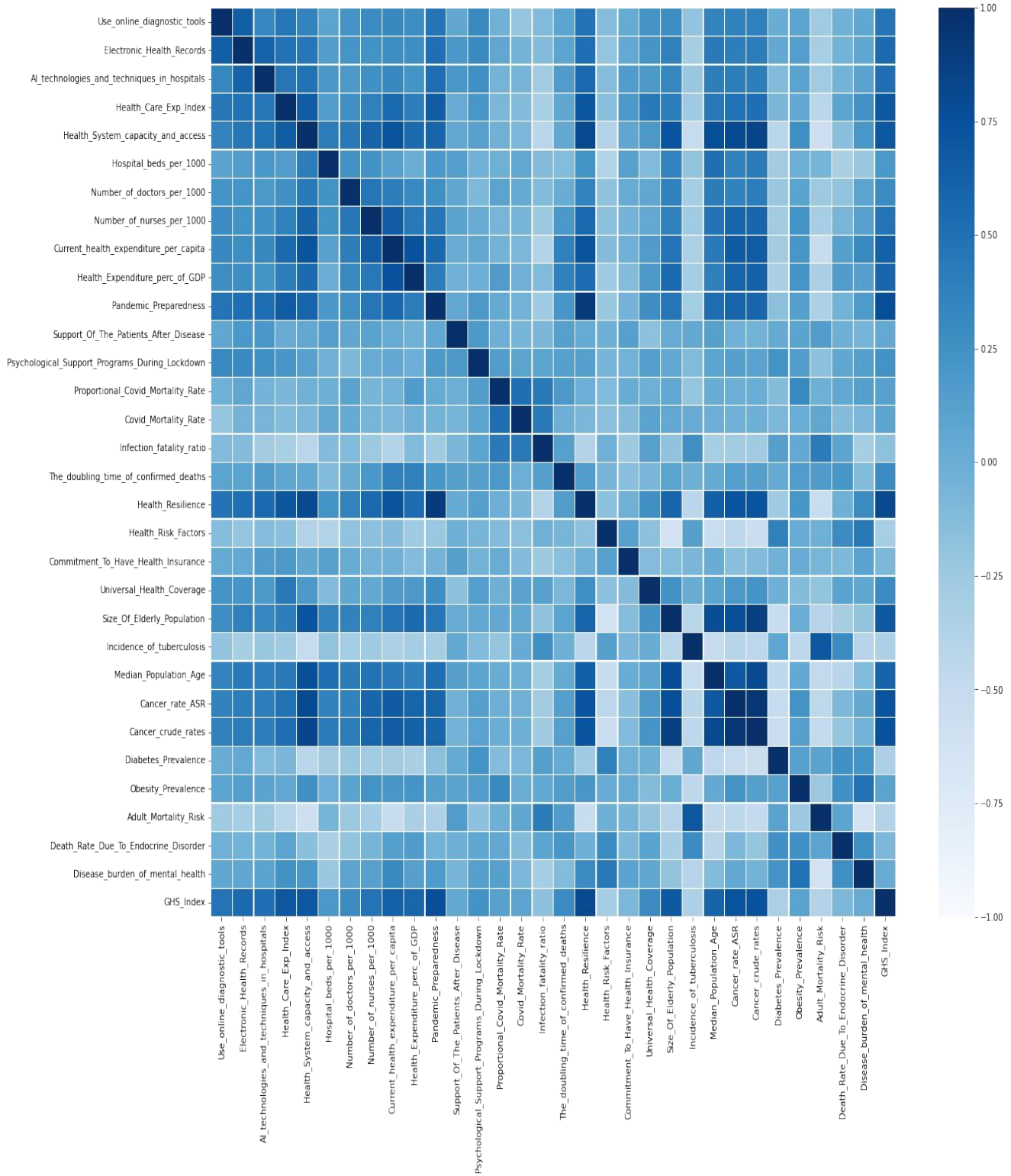
QUARANTINE EFFICIENCY – CORRELATION MATRIX



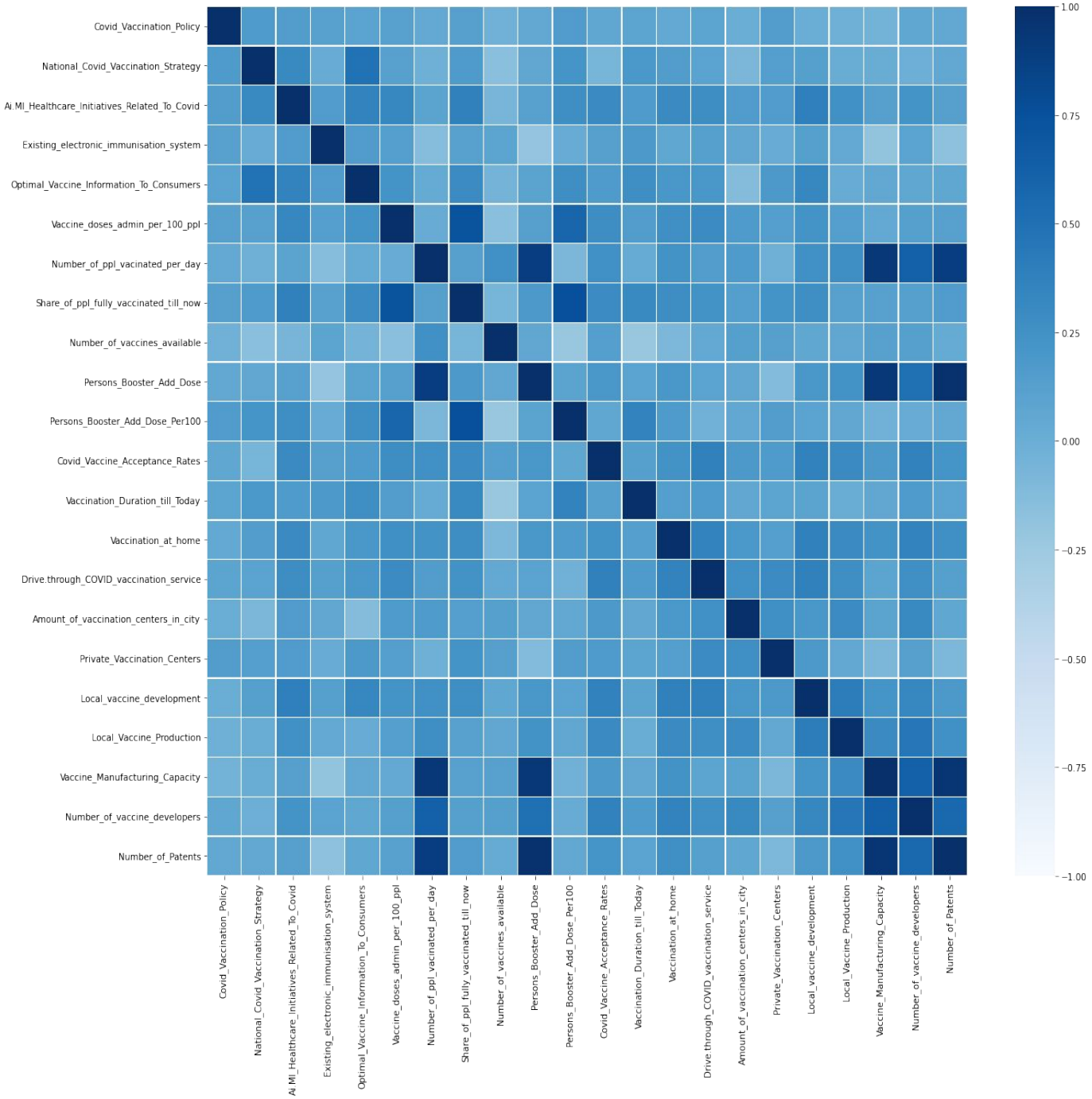
QUARANTINE EFFICIENCY – CORRELATION MATRIX



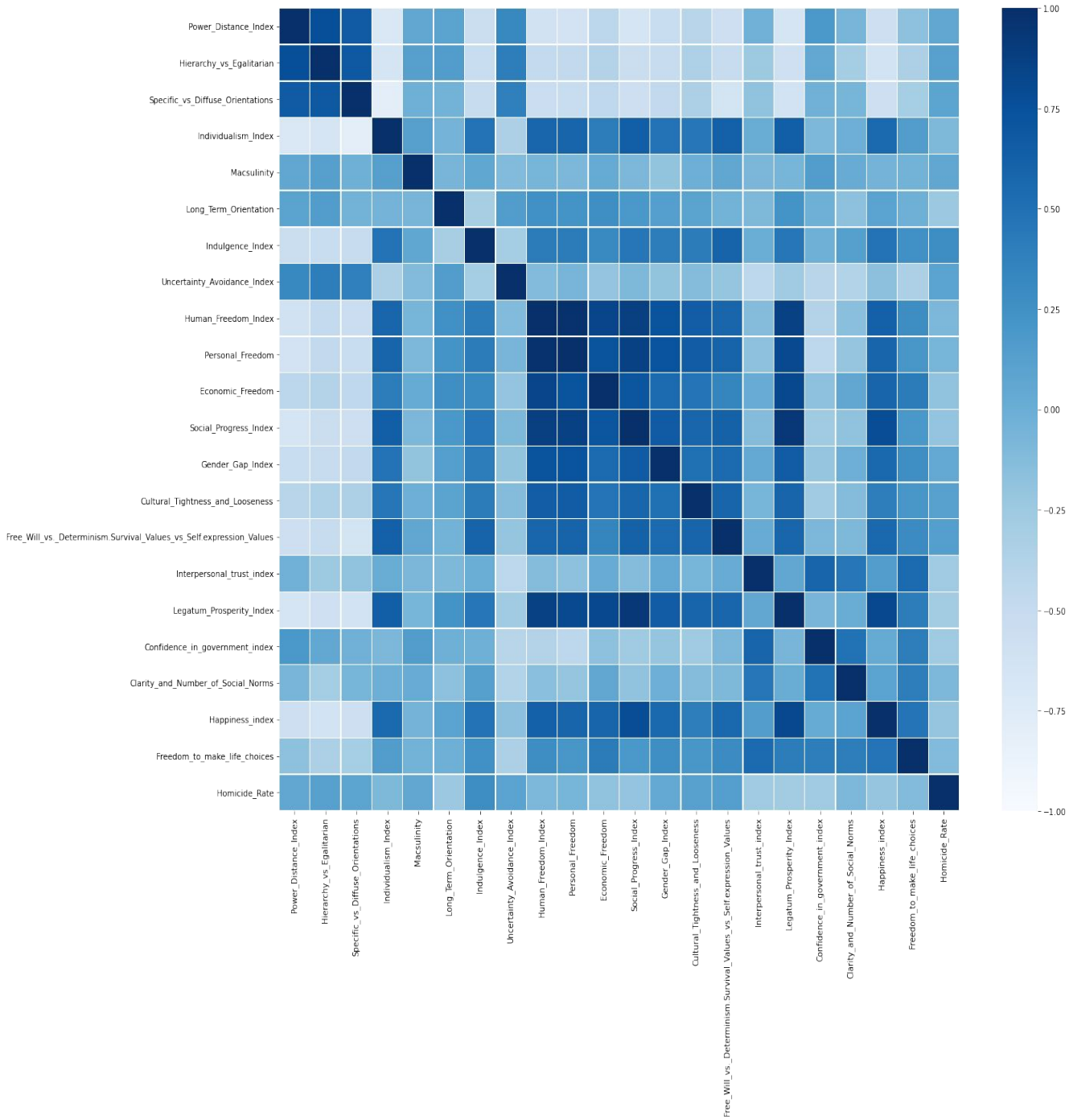
HEALTHCARE MANAGEMENT – CORRELATION MATRIX



VACCINATION RATE – CORRELATION MATRIX



CULTURAL COMPLIANCE – CORRELATION MATRIX



PANDEMIC-RESILIENT CITIES RANKING: PRINCIPAL COMPONENT ANALYSIS

Principal component analysis (PCA) is a data science technique used to quantitatively define the way that indicator weights are assigned in order to create a 'composite index' (a ranking based on a weighted sum of specific indicators). PCA allows us to remove redundant information that is shared among two or more indicators by creating a weighting that accounts for the greatest amount of variance within the data.

However, they should be viewed as complementary tools, and not as supplemental weights to override the default weights assigned to indicators, indicator groups, and categories or as a direct means of understanding the city ranking scores themselves. This is because they do not take the 'impact factor' into account or significance-based weights used in the model.

PCA gives a weight to each component in the ranking, which takes into account covariance between indicator groups and the degree to which a particular component (indicator, indicator group, or category) maximises the variation among scores in the index. In essence, it is a method used to minimise redundancy between variables and maximise variation as it pertains to the actual final index scores.

In simplified terms, it minimises the importance or impact of redundant factors shared among variables and maximises the importance or impact of non-redundant factors that contribute significantly to the final output of the ranking (the city scores).

Each PCA weight is calculated by taking the principal component (known as the eigenvector) associated with the highest explained variance (known as the eigenvalue), which constitutes a method of decomposing data into independent components ordered by informational content.

Valid PCA makes several important assumptions. These include (1) the assumption that variance is meaningful and not the result of significant measurement errors in the data itself; and (2) the assumption that the dynamics in question are along the direction with the largest variance.

Variation within indicator group weights is a sign that redundancy is occurring in the elements or that some elements are not as relevant in explaining the variation in the overall ranking once all the other variables are considered. Finding equal weights across indicator groups is a sign of very little redundancy across subgroups and similar relevance in explaining variation in the Pandemic-Resilient Cities Ranking. This suggests that the Ranking has been divided into subgroups appropriately.

1. **Perform PCA analysis on all indicator groups, ignoring the category they belong to.**
2. **Use the principal component associated with the highest eigenvalue.**
3. **Set negative components to zero.**
4. **Normalise indicator group weights (such that the sum of weights is equal to 1).**
5. **Normalise the category weights (such that the sum of categories is equal to 1).**
6. **Use the amount of the non-normalised indicator weights and assign this as the indicator group weight for that category.**
7. **Renormalise top-level indicator group weights across indicator groups so that those also sum to 1.**

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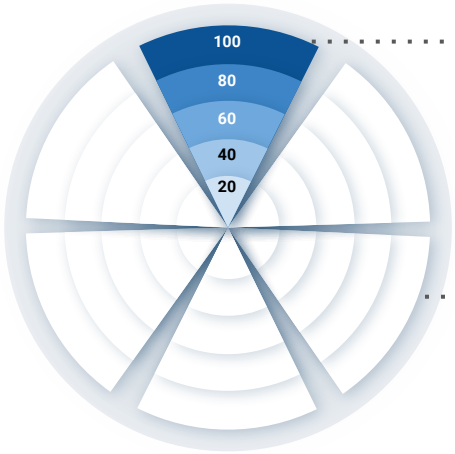
Pandemic-Resilient Cities Ranking 2022:

City Profiles

www.dka.global
info@dka.global

How To Read City Profiles:



Numbers on the rings show the score we calculated from 0 to 100. The occupancy of the rings depends on the assessment of the city according to one of the categories below.

The graph consists of six categories: Vaccination Rate (VR), Economic Resilience (ER), Government Efficiency (GE), Healthcare Management (HM), Cultural Compliance (CC), Quarantine Efficiency (QE).

Overall Score – **XX** /100

The arithmetic mean of the scores of all six categories gives us the overall score of the city.

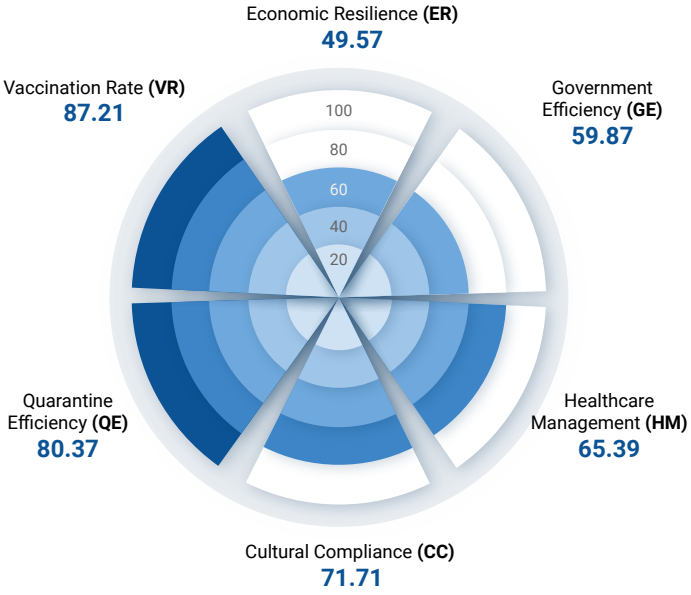
Each of the 6 categories is shown separately on this pie chart, with arc displaying the performance of local authorities in the context of this particular category. An arc closed in a ring is the maximum 100 points. The shorter the arc, the lower the indicator.

The groups of Indicators of each category are presented in the column chart list in the lower half of the city profile, where higher value stands for a more favorable score.

The average score for the indicator group among all cities in the ranking

Pandemic-Resilient Cities Ranking – Abu Dhabi

1/50



Overall Score – **69.02**/100

Abu Dhabi takes the lead among the Top 50 cities in the Pandemic-Resilient Cities Ranking. The city has been an exemplary case of efficient vaccination strategies, combined with effective contact tracing apps to prevent the spread of the virus. The economy rescue package is minimal since the city's economy has high levels of liquidity and capital buffers that would protect its economy and mitigate the effects of the pandemic. Abu Dhabi responded promptly to a new reality of online business by providing remote working guidelines, virtual labour markets, a national campaign for mental health support, and 24/7 online government services.

GE

Surveillance Practices
65.90
Public Involvement
89.97
Satisfaction With Government Performance
64.18
E-Readiness
71.33
Emergency Response Mechanism
19.57

ER

Resilient Capacity in Times of Crisis
45.12
Economic Resilience From Tourism Decline
55.86
Economy Rescue Package
1.14
Economy Vitality
58.62
Market Attractiveness
68.08
Wealth Indicator
76.28

QE

Prevention of COVID-19 Spread
80.64
COVID-19 Detection
75.34
City Preparedness for Pandemics
93.94
Post-COVID Strategy
100
Stringency of Containment Policy
54.61

HM

E-Health Score
94.45
Health System Resources
25.52
Healthcare COVID Response
85.74
Population Vulnerability
87.61
Public Health
48.68

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
78.91
Efficiency of Vaccine Allocation
100
Vaccine Production Capacity
60.90

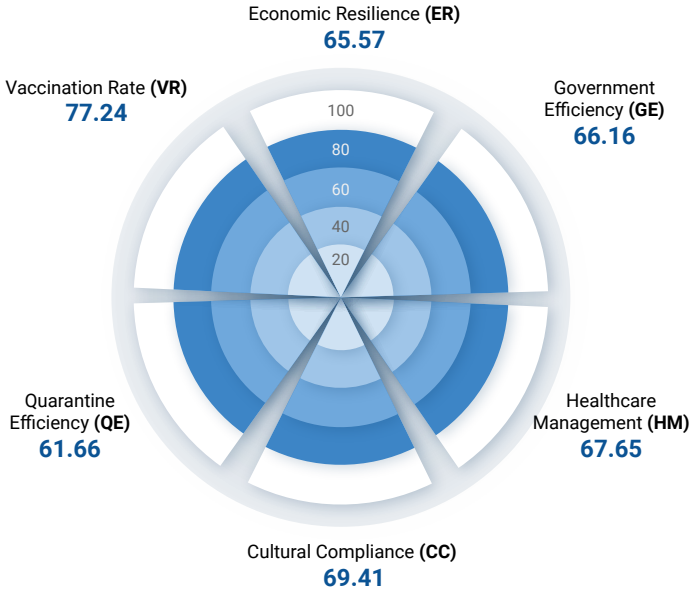
CC

Acceptance of Hierarchy
94.33
Degree of Social Interdependence
74
Risk Objection and Uncertainty Avoidance
76.28
Importance of Personal Freedom
42.03
Level of Prosperity and Life Opportunities
73.16
Strength of Social Norms
65.26

◇ Average score

Pandemic-Resilient Cities Ranking – Singapore

2/50



Overall Score – **67.95**/100

Singapore takes second place in the ranking. Unlike many other cities, it scores almost equally among most of the six measures of our interest. It has a relatively low Emergency Response Mechanism score because the city is an international trade hub and totally closing borders is not a feasible option. The city's Containment Policy was stricter than average, and the population's high compliance level helped to contain the spread of the virus. Going forward, the city-state needs to rethink urban planning, making districts self-sufficient and comfortable for possible future pandemics.

GE

Surveillance Practices	60.41
Public Involvement	83.31
Satisfaction With Government Performance	87.05
E-Readiness	71.22
Emergency Response Mechanism	31.05

ER

Resilient Capacity in Times of Crisis	52.79
Economic Resilience From Tourism Decline	58
Economy Rescue Package	43.24
Economy Vitality	67.79
Market Attractiveness	80.01
Wealth Indicator	94.80

QE

Prevention of COVID-19 Spread	44.06
COVID-19 Detection	70.89
City Preparedness for Pandemics	73.93
Post-COVID Strategy	60.21
Stringency of Containment Policy	65.84

HM

E-Health Score	95.29
Health System Resources	28.61
Healthcare COVID Response	89.14
Population Vulnerability	64.04
Public Health	75.81

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	68.94
Efficiency of Vaccine Allocation	72.92
Vaccine Production Capacity	72.06

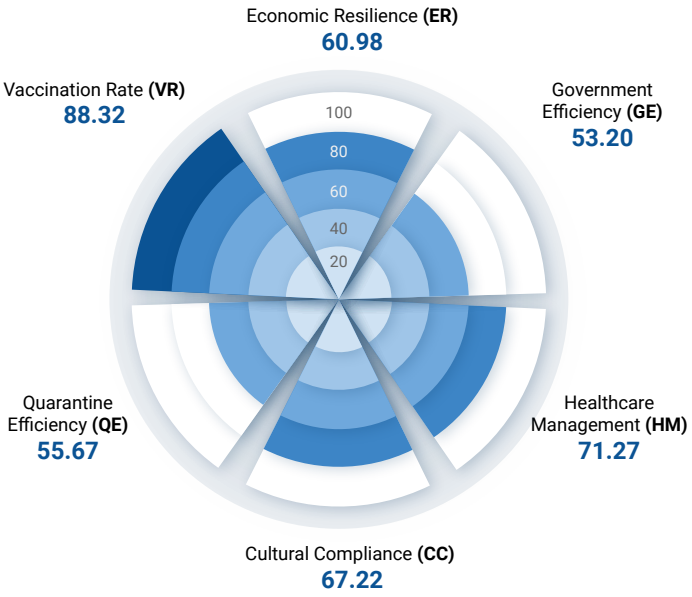
CC

Acceptance of Hierarchy	81.76
Degree of Social Interdependence	69.84
Risk Objection and Uncertainty Avoidance	49.92
Importance of Personal Freedom	79.29
Level of Prosperity and Life Opportunities	79.11
Strength of Social Norms	56.34

◇ Average score

Pandemic-Resilient Cities Ranking – Seoul

3/50



Overall Score – **66.11**/100

Seoul ranks third in the Pandemic-Resilient Cities Ranking. The city is a world leader in vaccination rates, with universal availability and efficient allocation of vaccines. Though its emergency response mechanism score is lower than average, the city has shown success across the three phases of the epidemic response framework: detection, containment, and treatment. Instead of closing businesses and issuing the stay-at-home orders adopted by other countries, Seoul has achieved its success by developing clear guidelines, conducting comprehensive testing and contact tracing, and supporting people in quarantine to make compliance easier.

GE

Surveillance Practices
75.60
Public Involvement
61.57
Satisfaction With Government Performance
53.94
E-Readiness
76.85
Emergency Response Mechanism
3.59

ER

Resilient Capacity in Times of Crisis
57.30
Economic Resilience From Tourism Decline
45.99
Economy Rescue Package
26.80
Economy Vitality
52.12
Market Attractiveness
91.84
Wealth Indicator
92.91

QE

Prevention of COVID-19 Spread
36.71
COVID-19 Detection
66.91
City Preparedness for Pandemics
73.93
Post-COVID Strategy
56.20
Stringency of Containment Policy
53.79

HM

E-Health Score
98.69
Health System Resources
43.78
Healthcare COVID Response
89.96
Population Vulnerability
62.66
Public Health
75.43

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
74.52
Efficiency of Vaccine Allocation
100
Vaccine Production Capacity
76.90

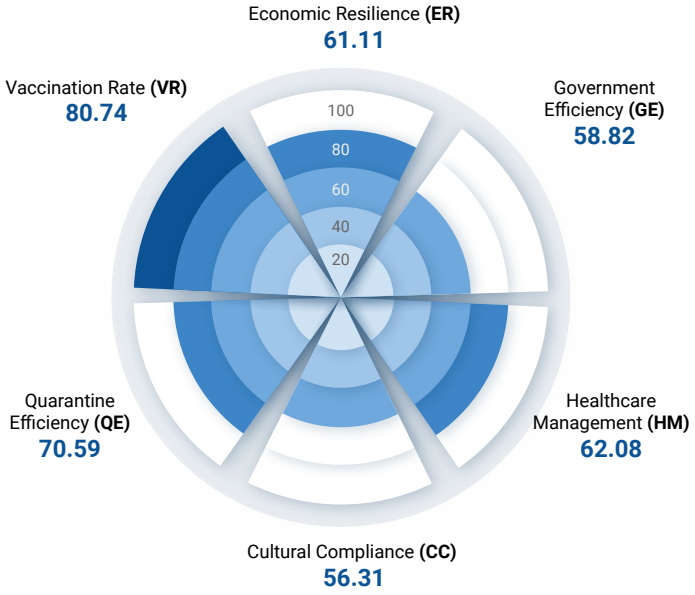
CC

Acceptance of Hierarchy
59.84
Degree of Social Interdependence
60.54
Risk Objection and Uncertainty Avoidance
87.94
Importance of Personal Freedom
81.86
Level of Prosperity and Life Opportunities
56.79
Strength of Social Norms
48.34

◇ Average score

Pandemic-Resilient Cities Ranking – Ottawa

4/50



Overall Score – **64.94**/100

Ottawa is number four in the Pandemic-Resilient Cities Ranking. Despite the overall low level of cultural compliance, due to a high level of individualism and tolerance of deviance, the vaccination rates were among the highest. The city ranks lower than average on surveillance practices, because of the relatively low number of law enforcement officers and surveillance cameras. In 2022, COVID-19 remains the biggest part of Ottawa's public health budget, aiming to reimburse the extraordinary costs of the virus in 2021.

GE

Surveillance Practices
27.12
Public Involvement
70.43
Satisfaction With Government Performance
60.21
E-Readiness
68.43
Emergency Response Mechanism
66.33

ER

Resilient Capacity in Times of Crisis
59.89
Economic Resilience From Tourism Decline
43.22
Economy Rescue Package
29.04
Economy Vitality
62.27
Market Attractiveness
88.46
Wealth Indicator
81.43

QE

Prevention of COVID-19 Spread
51.61
COVID-19 Detection
66.78
City Preparedness for Pandemics
98.68
Post-COVID Strategy
72.57
Stringency of Containment Policy
71.20

HM

E-Health Score
95.15
Health System Resources
37.81
Healthcare COVID Response
83.90
Population Vulnerability
46.92
Public Health
63.61

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
78.18
Efficiency of Vaccine Allocation
79.48
Vaccine Production Capacity
62.44

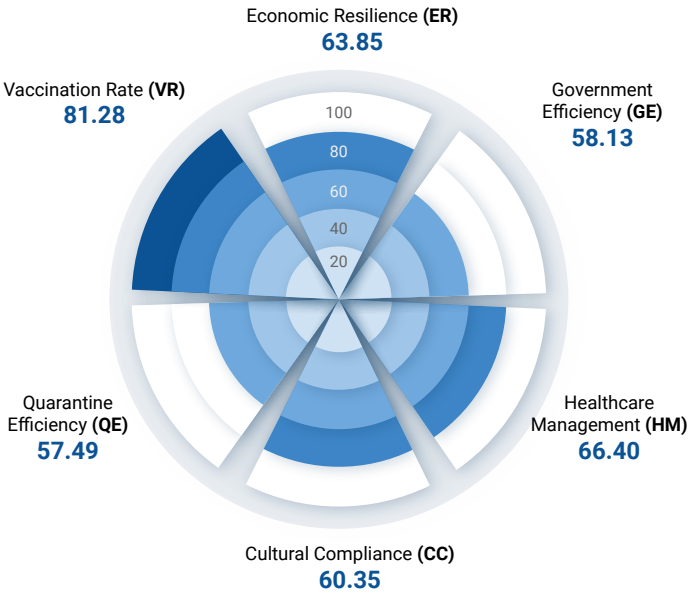
CC

Acceptance of Hierarchy
31.13
Degree of Social Interdependence
30
Risk Objection and Uncertainty Avoidance
29.67
Importance of Personal Freedom
90.51
Level of Prosperity and Life Opportunities
83.72
Strength of Social Norms
78.64

◇ Average score

Pandemic-Resilient Cities Ranking – Tokyo

5/50



Overall Score – **64.58**/100

Tokyo comes in at fifth place in the ranking. Although vaccination rates were among the highest, prevention of COVID spread and City Preparedness for Pandemics for the pandemic were lower than average. City Preparedness for Pandemics was low because there was no local COVID test production, which made testing and containment of the virus problematic. Prevention of COVID spread decreased compared to a year ago, as the more contagious omicron variant entered the densely populated city. The city's population is more vulnerable compared to other countries due to its very high share of elderly residents.

GE

Surveillance Practices
63.19

Public Involvement
60.17

Satisfaction With Government Performance
58.07

E-Readiness
63.40

Emergency Response Mechanism
47.14

ER

Resilient Capacity in Times of Crisis
60.63

Economic Resilience From Tourism Decline
43.15

Economy Rescue Package
71.32

Economy Vitality
49.92

Market Attractiveness
71

Wealth Indicator
83.64

QE

Prevention of COVID-19 Spread
34.40

COVID-19 Detection
68.75

City Preparedness for Pandemics
49.70

Post-COVID Strategy
74.72

Stringency of Containment Policy
58.31

HM

E-Health Score
97.91

Health System Resources
46.17

Healthcare COVID Response
81.96

Population Vulnerability
40.77

Public Health
80.72

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
60.44

Efficiency of Vaccine Allocation
100

Vaccine Production Capacity
60.40

CC

Acceptance of Hierarchy
54.53

Degree of Social Interdependence
20.88

Risk Objection and Uncertainty Avoidance
66.38

Importance of Personal Freedom
88.12

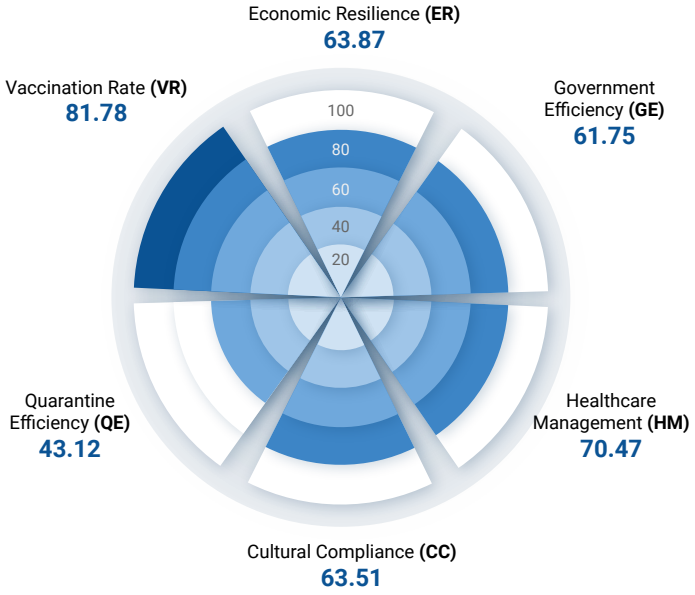
Level of Prosperity and Life Opportunities
65.58

Strength of Social Norms
52.50

◇ Average score

Pandemic-Resilient Cities Ranking – Zurich

6/50



Overall Score – **64.09**/100

Zurich comes sixth in the ranking. With local production and efficient allocation of vaccines, the city has achieved an extremely high vaccination rate. Economic resilience was strong on every parameter and additionally, an economic rescue package was created to support the most affected sectors such as tourism. The city scored low on containment measures because the measures were not mandatory but recommended. Post-COVID strategy is rated low, because a comprehensive emergency plan was not found.

GE

Surveillance Practices
42.61

Public Involvement
84.03

Satisfaction With Government Performance
65.39

E-Readiness
69.31

Emergency Response Mechanism
51.98

ER

Resilient Capacity in Times of Crisis
60.12

Economic Resilience From Tourism Decline
48.07

Economy Rescue Package
39.42

Economy Vitality
62.84

Market Attractiveness
86.35

Wealth Indicator
84.99

QE

Prevention of COVID-19 Spread
47.49

COVID-19 Detection
69.85

City Preparedness for Pandemics
55.62

Post-COVID Strategy
24.01

Stringency of Containment Policy
30.31

HM

E-Health Score
96.70

Health System Resources
61.04

Healthcare COVID Response
81.32

Population Vulnerability
60.08

Public Health
65.83

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
56.11

Efficiency of Vaccine Allocation
100

Vaccine Production Capacity
72.38

CC

Acceptance of Hierarchy
46.28

Degree of Social Interdependence
29.51

Risk Objection and Uncertainty Avoidance
44.40

Importance of Personal Freedom
95.48

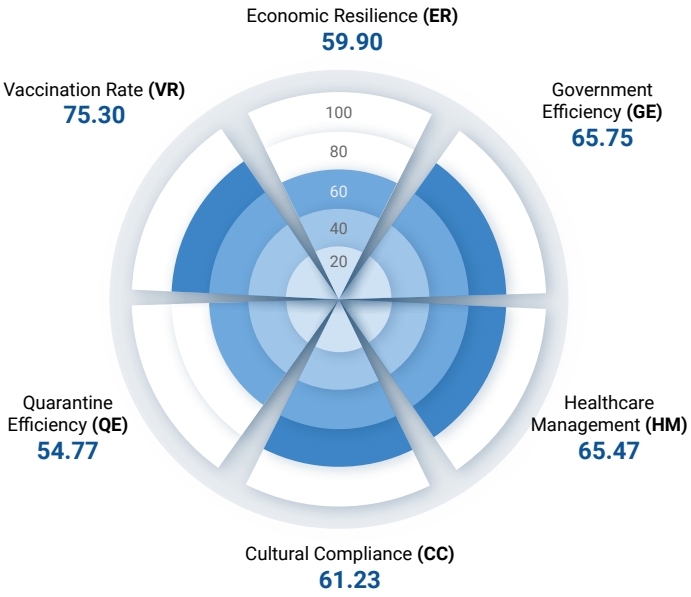
Level of Prosperity and Life Opportunities
91.61

Strength of Social Norms
72.16

◇ Average score

Pandemic-Resilient Cities Ranking – Amsterdam

7/50



Overall Score – **63.74**/100

Amsterdam comes in at seventh place. Due to containment and closure measures, the economy of the city shrank, like many others. The negative effects of the virus on the business sector and individuals were partially covered by a generous economic rescue package. Though vaccines were widely affordable, in February, the omicron variant led to a surge in the number of caseo. In addition to that, there was no special training for doctors and nurses for the pandemic response, which is captured in the city's low score in pandemic preparedness.

GE

Surveillance Practices
60.38

Public Involvement
77.12

Satisfaction With Government Performance
64.11

E-Readiness
76.09

Emergency Response Mechanism
54.25

ER

Resilient Capacity in Times of Crisis
40.66

Economic Resilience From Tourism Decline
46.66

Economy Rescue Package
40.42

Economy Vitality
58.16

Market Attractiveness
87.61

Wealth Indicator
86.46

QE

Prevention of COVID-19 Spread
41.07

COVID-19 Detection
69.42

City Preparedness for Pandemics
59.13

Post-COVID Strategy
60.07

Stringency of Containment Policy
48.62

HM

E-Health Score
96.33

Health System Resources
44.11

Healthcare COVID Response
86.13

Population Vulnerability
51.38

Public Health
65.30

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
68.30

Efficiency of Vaccine Allocation
79.56

Vaccine Production Capacity
47.52

CC

Acceptance of Hierarchy
33.42

Degree of Social Interdependence
49.72

Risk Objection and Uncertainty Avoidance
40.19

Importance of Personal Freedom
88.45

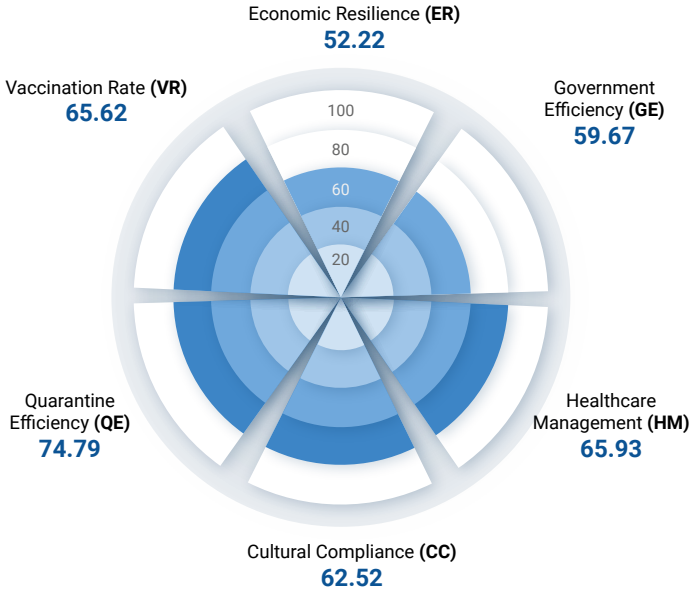
Level of Prosperity and Life Opportunities
87.21

Strength of Social Norms
77.84

◇ Average score

Pandemic-Resilient Cities Ranking – Beijing

8/50



Overall Score – **63.46**/100

Beijing takes eighth place in the Ranking. This score is achieved thanks to very strict quarantine and containment measures, known as a 'zero-Covid strategy'. However, with the more recent omicron variant, the prevention of spread is more difficult. China also has a ban on the import of foreign vaccines, even though there is evidence that China's own domestic vaccines are less effective. Strict lockdowns are possible due to low levels of personal freedom and the hierarchical structure of Chinese society. However, these measures are negatively affecting the economy of Beijing and have led to increased dissatisfaction with the government.

GE

- Surveillance Practices: 76.30
- Public Involvement: 82.06
- Satisfaction With Government Performance: 52.86
- E-Readiness: 51.71
- Emergency Response Mechanism: 48.72

ER

- Resilient Capacity in Times of Crisis: 50.12
- Economic Resilience From Tourism Decline: 54
- Economy Rescue Package: 25.34
- Economy Vitality: 38.45
- Market Attractiveness: 73.94
- Wealth Indicator: 77.21

QE

- Prevention of COVID-19 Spread: 69.09
- COVID-19 Detection: 66.35
- City Preparedness for Pandemics: 94.71
- Post-COVID Strategy: 87.41
- Stringency of Containment Policy: 61.15

HM

- E-Health Score: 93.09
- Health System Resources: 23.74
- Healthcare COVID Response: 80.02
- Population Vulnerability: 69.61
- Public Health: 76.65

VR

- Affordability of COVID-19 Vaccines: 80.72
- Deployment of COVID-19 Vaccines: 72.59
- Efficiency of Vaccine Allocation: 33.86
- Vaccine Production Capacity: 95.30

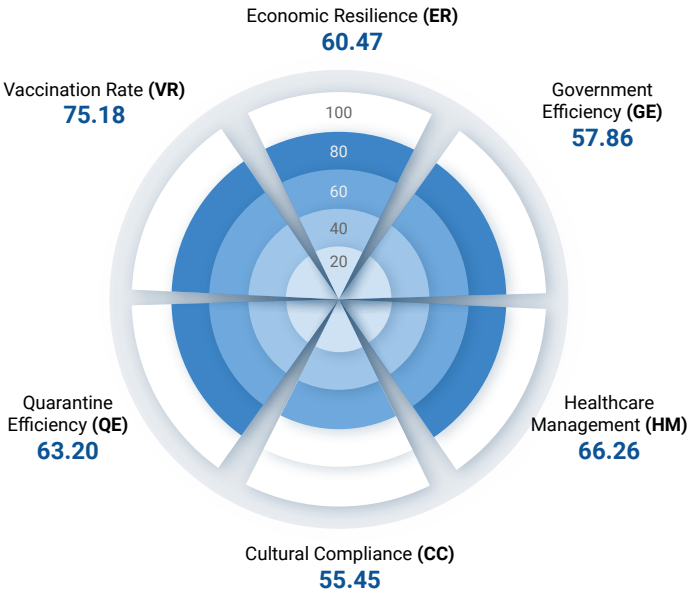
CC

- Acceptance of Hierarchy: 92.89
- Degree of Social Interdependence: 69.65
- Risk Objection and Uncertainty Avoidance: 51.95
- Importance of Personal Freedom: 30.78
- Level of Prosperity and Life Opportunities: 59.89
- Strength of Social Norms: 69.14

◇ Average score

Pandemic-Resilient Cities Ranking – Toronto

9/50



Overall Score – **63.07**/100

Toronto comes in at ninth place in the Pandemic-Resilient Cities Ranking. The city's economy proved remarkably resilient to the pandemic. The municipality financially supported businesses affected by the crisis, and health system resources are above average. The city has a low cultural compliance score due to its egalitarian culture with highly individualistic traits. Nevertheless, the city had high vaccination rates and strict containment measures compared to many other regions.

GE

Surveillance Practices
28.03
Public Involvement
61.72
Satisfaction With Government Performance
60.21
E-Readiness
68.43
Emergency Response Mechanism
66.33

ER

Resilient Capacity in Times of Crisis
58.94
Economic Resilience From Tourism Decline
43.22
Economy Rescue Package
29.04
Economy Vitality
62.27
Market Attractiveness
85.90
Wealth Indicator
81.43

QE

Prevention of COVID-19 Spread
43.56
COVID-19 Detection
65.59
City Preparedness for Pandemics
82.44
Post-COVID Strategy
72.57
Stringency of Containment Policy
58.88

HM

E-Health Score
95.15
Health System Resources
48.93
Healthcare COVID Response
83.90
Population Vulnerability
58.41
Public Health
59.57

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
66.69
Efficiency of Vaccine Allocation
79.48
Vaccine Production Capacity
50.15

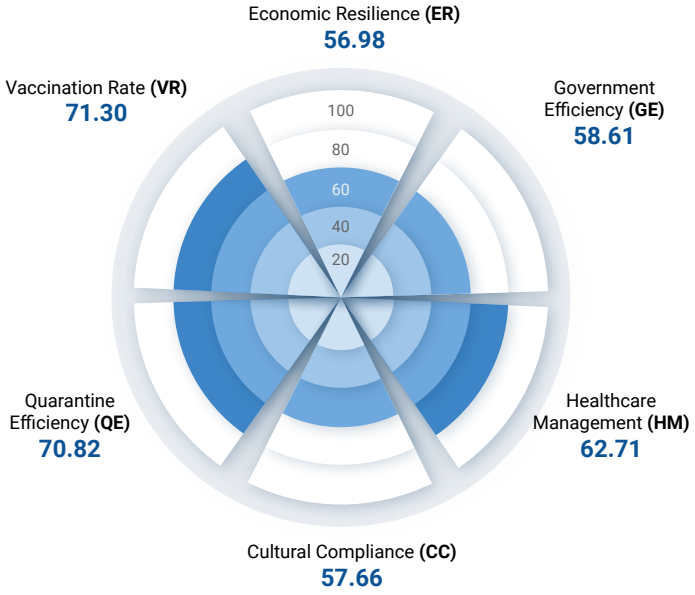
CC

Acceptance of Hierarchy
31.13
Degree of Social Interdependence
27.34
Risk Objection and Uncertainty Avoidance
29.67
Importance of Personal Freedom
90.51
Level of Prosperity and Life Opportunities
83.72
Strength of Social Norms
74.85

◇ Average score

Pandemic-Resilient Cities Ranking – Auckland

10/50



Overall Score – **63.05**/100

Auckland ranks tenth in the Pandemic-Resilient Cities Ranking. The city's health system was well-prepared to manage the state of emergency. The government imposed very strict and efficient containment measures, which included harsh lockdowns and border controls. Vaccine production is at the trial stage, and the deployment of vaccines is lower than average. This could be due to relatively high levels of vaccine hesitancy, which has been shown by the presence of huge protests.

GE

Surveillance Practices
28.34
Public Involvement
84.23
Satisfaction With Government Performance
66.20
E-Readiness
88.28
Emergency Response Mechanism
28.90

ER

Resilient Capacity in Times of Crisis
65.24
Economic Resilience From Tourism Decline
39.91
Economy Rescue Package
26.09
Economy Vitality
54.15
Market Attractiveness
73.83
Wealth Indicator
81.49

QE

Prevention of COVID-19 Spread
70.44
COVID-19 Detection
69.88
City Preparedness for Pandemics
90.29
Post-COVID Strategy
61.77
Stringency of Containment Policy
69.32

HM

E-Health Score
95.55
Health System Resources
41.42
Healthcare COVID Response
83.03
Population Vulnerability
55.24
Public Health
55

VR

Affordability of COVID-19 Vaccines
80.72
Deployment of COVID-19 Vaccines
59.40
Efficiency of Vaccine Allocation
88.64
Vaccine Production Capacity
21.57

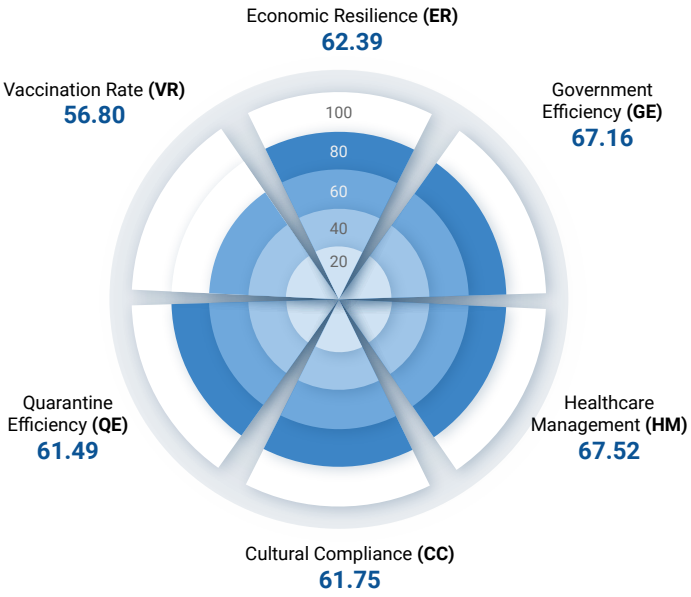
CC

Acceptance of Hierarchy
30.37
Degree of Social Interdependence
50.78
Risk Objection and Uncertainty Avoidance
27.13
Importance of Personal Freedom
94.57
Level of Prosperity and Life Opportunities
90.26
Strength of Social Norms
64.28

◇ Average score

Pandemic-Resilient Cities Ranking – Oslo

11/50



Overall Score – **62.85**/100

Oslo comes in at 11th place. The city scored low in containment measures, since Norway eased all the measures in September, following other Nordic countries in returning to a 'back-to-normal' state. The city's residents are among the most satisfied with the government's handling of the pandemic. Containment measures were introduced mostly as recommendations and were followed by the citizens, which can be observed in the good score of virus spread prevention.

GE

Surveillance Practices
43.18

Public Involvement
85.75

Satisfaction With Government Performance
97.61

E-Readiness
74.13

Emergency Response Mechanism
33.18

ER

Resilient Capacity in Times of Crisis
48.19

Economic Resilience From Tourism Decline
47.30

Economy Rescue Package
37.92

Economy Vitality
61.53

Market Attractiveness
91.49

Wealth Indicator
87.56

QE

Prevention of COVID-19 Spread
68.02

COVID-19 Detection
70.05

City Preparedness for Pandemics
82.71

Post-COVID Strategy
65.70

Stringency of Containment Policy
30.41

HM

E-Health Score
78.33

Health System Resources
55.25

Healthcare COVID Response
87.12

Population Vulnerability
60.04

Public Health
64.05

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
71.73

Efficiency of Vaccine Allocation
31.87

Vaccine Production Capacity
18.61

CC

Acceptance of Hierarchy
34.10

Degree of Social Interdependence
54.83

Risk Objection and Uncertainty Avoidance
33.77

Importance of Personal Freedom
88.76

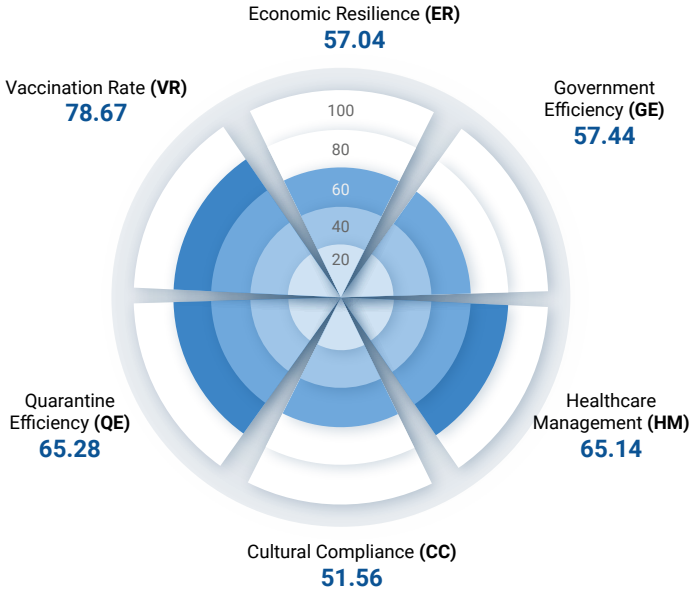
Level of Prosperity and Life Opportunities
96.04

Strength of Social Norms
75.22

◇ Average score

Pandemic-Resilient Cities Ranking – Canberra

12/50



Overall Score – **62.52**/100

Canberra, Australia comes in at 12th place. A city's economy has not been hit as hard as many other cities, because Canberra's main industry is public administration and safety, which accounts for almost 30% of the city's gross territory product. Though the economic rescue package from the government was modest, it included much-needed aid for the affected sectors; income support for workers; a small business hardship scheme; and other forms of aid. The city's Containment Policy score was well above the average stringency level, which is unusual in a 'loose' culture such as that of Canberra, which might have caused huge protests.

GE

Surveillance Practices
57.77

Public Involvement
57.63

Satisfaction With Government Performance
60.37

E-Readiness
70.44

Emergency Response Mechanism
39.87

ER

Resilient Capacity in Times of Crisis
60.71

Economic Resilience From Tourism Decline
42.69

Economy Rescue Package
10.57

Economy Vitality
61.09

Market Attractiveness
82.68

Wealth Indicator
84.94

QE

Prevention of COVID-19 Spread
53.03

COVID-19 Detection
69.55

City Preparedness for Pandemics
72.91

Post-COVID Strategy
56.39

Stringency of Containment Policy
78.84

HM

E-Health Score
97.14

Health System Resources
47.21

Healthcare COVID Response
91.10

Population Vulnerability
53.90

Public Health
53.40

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
66.34

Efficiency of Vaccine Allocation
87.13

Vaccine Production Capacity
57.72

CC

Acceptance of Hierarchy
20.98

Degree of Social Interdependence
28.87

Risk Objection and Uncertainty Avoidance
25.50

Importance of Personal Freedom
90.91

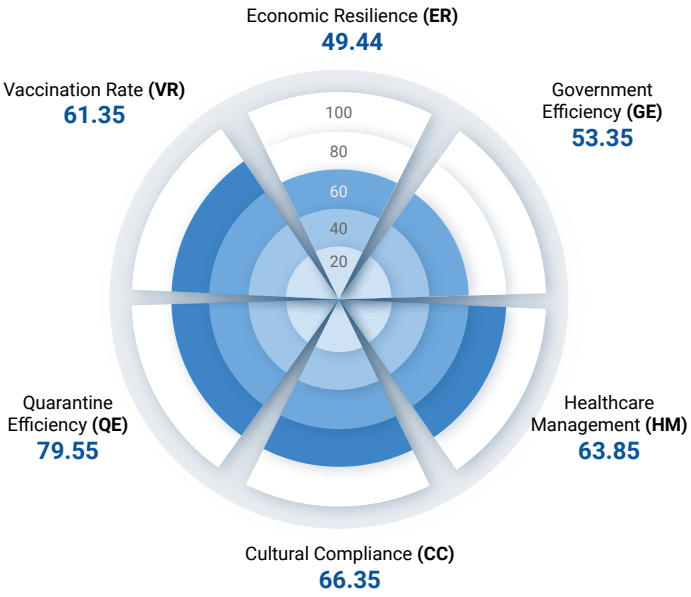
Level of Prosperity and Life Opportunities
83.59

Strength of Social Norms
66.75

◇ Average score

Pandemic-Resilient Cities Ranking – Almaty

13/50



Overall Score – **62.31**/100

Almaty, Kazakhstan is ranked 13th in the Pandemic-Resilient Cities Ranking. Prevention of COVID-19 spread was successful, with a series of containment measures and electronic infection tracing systems that granted access to public spaces only to the fully vaccinated. The economic impact of COVID-19 was severe, forcing the government to withdraw money from the National Oil Fund, which forms a substantial part of the country's wealth. The funds were used to support individuals and businesses, particularly SMEs. The deployment of vaccines was lower than average due to high levels of vaccine hesitancy in the population.

GE

Surveillance Practices
68.60
Public Involvement
58.21
Satisfaction With Government Performance
50.04
E-Readiness
57.19
Emergency Response Mechanism
37.50

ER

Resilient Capacity in Times of Crisis
47.57
Economic Resilience From Tourism Decline
39.42
Economy Rescue Package
4.11
Economy Vitality
36.06
Market Attractiveness
91.42
Wealth Indicator
80.74

QE

Prevention of COVID-19 Spread
81.05
COVID-19 Detection
69.40
City Preparedness for Pandemics
74.67
Post-COVID Strategy
88.88
Stringency of Containment Policy
79.14

HM

E-Health Score
90.82
Health System Resources
25.39
Healthcare COVID Response
70.53
Population Vulnerability
80
Public Health
64.90

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
40.27
Efficiency of Vaccine Allocation
72.92
Vaccine Production Capacity
28.45

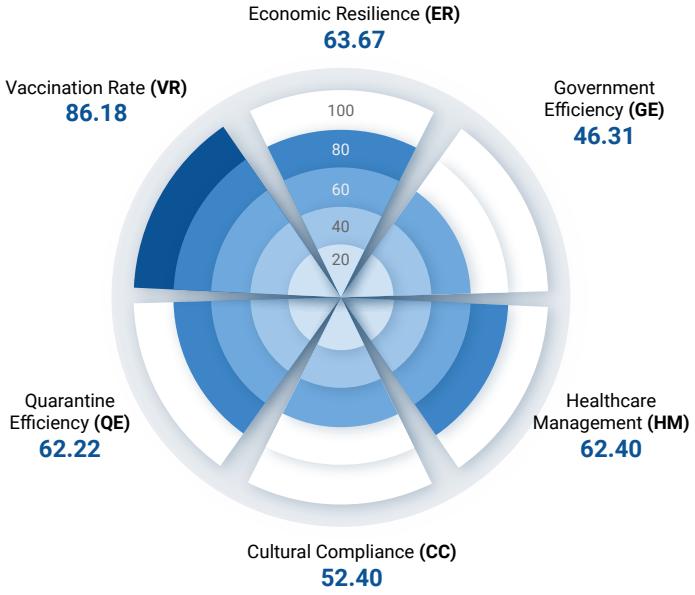
CC

Acceptance of Hierarchy
76.15
Degree of Social Interdependence
57.27
Risk Objection and Uncertainty Avoidance
86.63
Importance of Personal Freedom
53.04
Level of Prosperity and Life Opportunities
59.79
Strength of Social Norms
54.57

◇ Average score

Pandemic-Resilient Cities Ranking – New York

14/50



Overall Score – **62.20**/100

New York takes 14th place in the ranking. To date, around 75% of the population is fully vaccinated, and vaccines are readily available to all residents. The public health parameter is lower than average, mainly due to obesity prevalence, which puts citizens at greater risk during a pandemic. The city's economy is coping well post-crisis, and its residents have benefitted from a generous economic rescue package for affected citizens and businesses. As a cosmopolitan city, New York is an individualistic society that affords high value to personal freedom.

GE

Surveillance Practices	31.86
Public Involvement	62.82
Satisfaction With Government Performance	51.89
E-Readiness	70.42
Emergency Response Mechanism	16.26

ER

Resilient Capacity in Times of Crisis	62.85
Economic Resilience From Tourism Decline	63.85
Economy Rescue Package	39.68
Economy Vitality	76.98
Market Attractiveness	63.23
Wealth Indicator	78.50

QE

Prevention of COVID-19 Spread	60.10
COVID-19 Detection	49.65
City Preparedness for Pandemics	73.93
Post-COVID Strategy	78.65
Stringency of Containment Policy	49.33

HM

E-Health Score	94.45
Health System Resources	61.72
Healthcare COVID Response	74.58
Population Vulnerability	56.41
Public Health	40.11

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	61.82
Efficiency of Vaccine Allocation	100
Vaccine Production Capacity	88.94

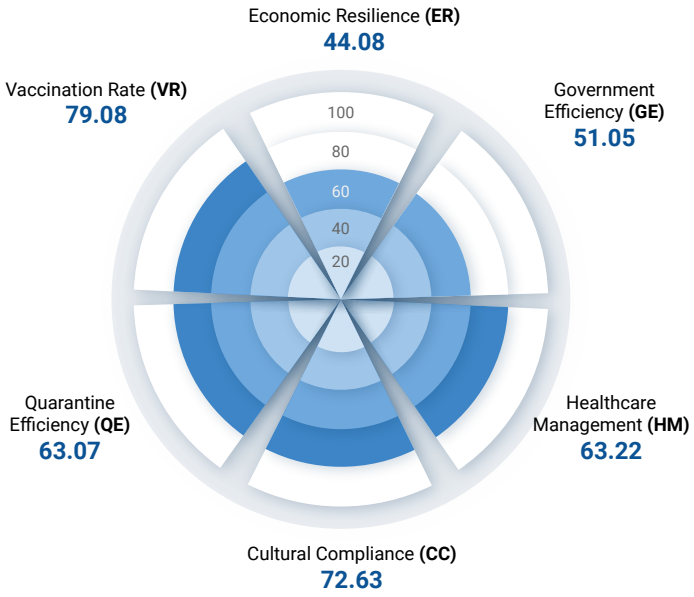
CC

Acceptance of Hierarchy	24.07
Degree of Social Interdependence	23.71
Risk Objection and Uncertainty Avoidance	26.16
Importance of Personal Freedom	87.11
Level of Prosperity and Life Opportunities	77.06
Strength of Social Norms	82.87

◇ Average score

Pandemic-Resilient Cities Ranking – Dubai

15/50



Overall Score – **62.19**/100

Dubai ranks 15th in the the Pandemic-Resilient Cities Ranking. The city continues to employ advanced technology and safety controls to monitor and detect the incidences, together with stringent measures across every touchpoint from airports to leisure and entertainment facilities. The country reports 99% of population having received at least one one dose, with vaccines being available free of charge across the country. The stringency of containment policy scores is low, however recently the UAE started to tighten rules as the numbers of cases rise. Multi-pronged fiscal initiatives helped Dubai limit the economic impact of the pandemic.

GE

Surveillance Practices	63.71
Public Involvement	73.92
Satisfaction With Government Performance	64.18
E-Readiness	71.33
Emergency Response Mechanism	10.87

ER

Resilient Capacity in Times of Crisis	45.12
Economic Resilience From Tourism Decline	63.85
Economy Rescue Package	1.14
Economy Vitality	40.77
Market Attractiveness	47.04
Wealth Indicator	80.43

QE

Prevention of COVID-19 Spread	68.42
COVID-19 Detection	75.34
City Preparedness for Pandemics	96.54
Post-COVID Strategy	94.16
Stringency of Containment Policy	17

HM

E-Health Score	94.45
Health System Resources	21.04
Healthcare COVID Response	79.80
Population Vulnerability	87.61
Public Health	48.68

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	78.91
Efficiency of Vaccine Allocation	94.70
Vaccine Production Capacity	31.35

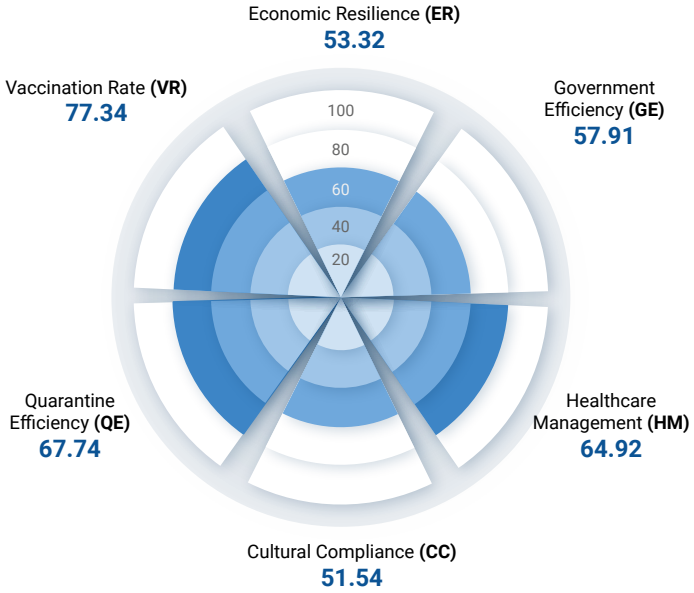
CC

Acceptance of Hierarchy	94.33
Degree of Social Interdependence	74
Risk Objection and Uncertainty Avoidance	76.28
Importance of Personal Freedom	42.03
Level of Prosperity and Life Opportunities	73.16
Strength of Social Norms	71.52

◇ Average score

Pandemic-Resilient Cities Ranking – Sydney

16/50



Overall Score – **62.13**/100

Sydney takes 16th place in the ranking. The city is among the most heavily integrated into the global economy, which is why problems in the supply chain caused by the pandemic had such a large effect. Lower tourism numbers also had a substantial impact, since the city is a gateway to Australia for many international visitors. Fiscal support provided to compensate for the effects of the pandemic included an eviction moratorium as well as cash payments to those who lost jobs. City governors are also designing a new urban planning system to adapt to the 'new normal' and to prepare for future pandemics.

GE

- Surveillance Practices: 60.46
- Public Involvement: 57.63
- Satisfaction With Government Performance: 60.37
- E-Readiness: 70.37
- Emergency Response Mechanism: 39.87

ER

- Resilient Capacity in Times of Crisis: 44.06
- Economic Resilience From Tourism Decline: 42.65
- Economy Rescue Package: 10.57
- Economy Vitality: 61.09
- Market Attractiveness: 79.17
- Wealth Indicator: 84.94

QE

- Prevention of COVID-19 Spread: 47.87
- COVID-19 Detection: 69.85
- City Preparedness for Pandemics: 98.29
- Post-COVID Strategy: 56.39
- Stringency of Containment Policy: 78.84

HM

- E-Health Score: 97.14
- Health System Resources: 46.26
- Healthcare COVID Response: 91.10
- Population Vulnerability: 53.90
- Public Health: 53.40

VR

- Affordability of COVID-19 Vaccines: 100
- Deployment of COVID-19 Vaccines: 69.14
- Efficiency of Vaccine Allocation: 79.48
- Vaccine Production Capacity: 59

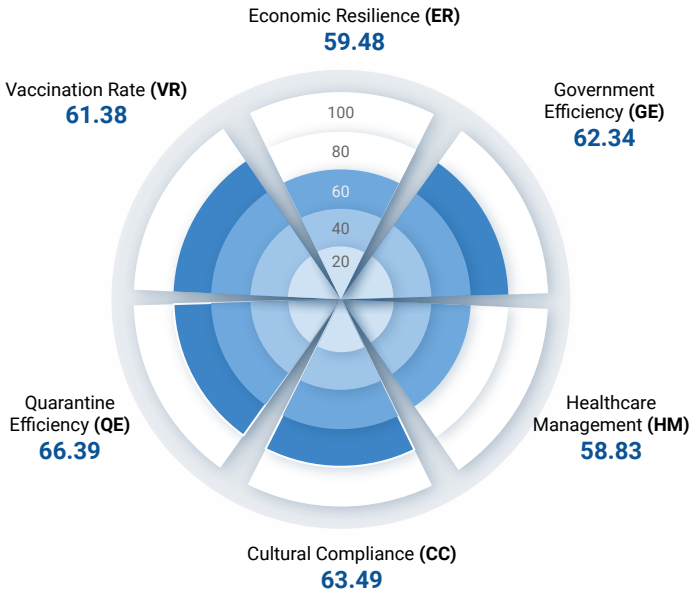
CC

- Acceptance of Hierarchy: 20.98
- Degree of Social Interdependence: 28.87
- Risk Objection and Uncertainty Avoidance: 25.50
- Importance of Personal Freedom: 90.91
- Level of Prosperity and Life Opportunities: 83.59
- Strength of Social Norms: 66.62

◇ Average score

Pandemic-Resilient Cities Ranking – Manama

17/50



Overall Score – **61.98**/100

Manama, Bahrain takes 17th place among the Top 50. Bahrain set up a committed National Taskforce named 'Team Bahrain' to handle the spread of COVID-19 and took measures to ensure that testing and isolated facilities were set up immediately. The country has one of the highest testing rates per capita, obtaining the acknowledgement of the World Health. Still, the government should consider the COVID-19 experience to increase national health capacities as well as biomanufacturing facilities in order to be more self-sufficient when it comes to global crisis.

GE

Surveillance Practices
63.77
Public Involvement
72.11
Satisfaction With Government Performance
50.22
E-Readiness
86.54
Emergency Response Mechanism
43.60

ER

Resilient Capacity in Times of Crisis
61.96
Economic Resilience From Tourism Decline
45.55
Economy Rescue Package
47.78
Economy Vitality
37.28
Market Attractiveness
76.48
Wealth Indicator
88.78

QE

Prevention of COVID-19 Spread
82.79
COVID-19 Detection
70.13
City Preparedness for Pandemics
53.59
Post-COVID Strategy
79.94
Stringency of Containment Policy
40.66

HM

E-Health Score
94.56
Health System Resources
17.82
Healthcare COVID Response
78.89
Population Vulnerability
82.20
Public Health
38.53

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
66.53
Efficiency of Vaccine Allocation
46.35
Vaccine Production Capacity
29.19

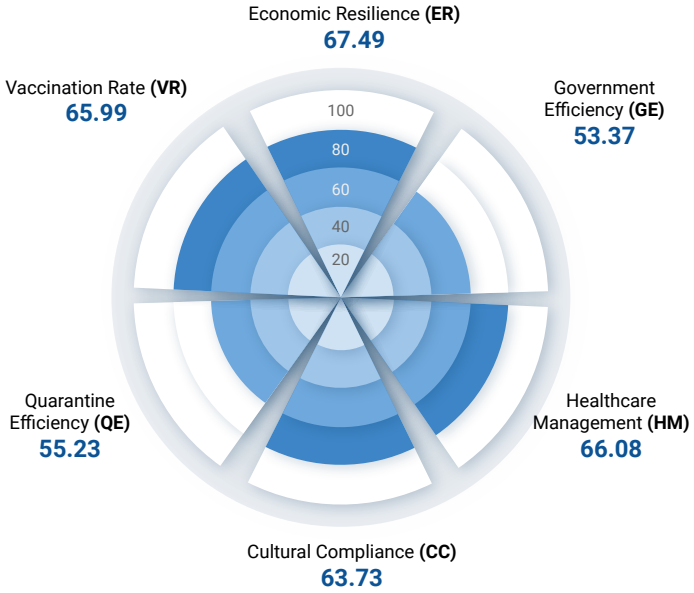
CC

Acceptance of Hierarchy
83.48
Degree of Social Interdependence
61.34
Risk Objection and Uncertainty Avoidance
70.55
Importance of Personal Freedom
35.71
Level of Prosperity and Life Opportunities
65.04
Strength of Social Norms
58.37

◇ Average score

Pandemic-Resilient Cities Ranking – Berlin

18/50



Overall Score – **61.98**/100

Berlin takes 18th place in the ranking. It boasts one of the highest vaccination rates among the cities included, with almost 78% of its population being fully vaccinated and about 64% having received a booster. As with many other populous cities, Berlin experienced a surge of COVID-19 cases with the spread of the omicron variant. More than 84% of Berlin's companies operate in the service sector, which was the hardest-hit sector during the pandemic. The government implemented very substantial economic rescue measures to offset the effects of COVID-19.

GE

Surveillance Practices
29.74
Public Involvement
68.84
Satisfaction With Government Performance
60.17
E-Readiness
64
Emergency Response Mechanism
44.47

ER

Resilient Capacity in Times of Crisis
64.13
Economic Resilience From Tourism Decline
53.03
Economy Rescue Package
65.37
Economy Vitality
56.55
Market Attractiveness
78.45
Wealth Indicator
85.94

QE

Prevention of COVID-19 Spread
36.42
COVID-19 Detection
63.36
City Preparedness for Pandemics
82.87
Post-COVID Strategy
51.99
Stringency of Containment Policy
53.72

HM

E-Health Score
95.58
Health System Resources
54.32
Healthcare COVID Response
85.11
Population Vulnerability
49.46
Public Health
61.05

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
75.02
Efficiency of Vaccine Allocation
31.62
Vaccine Production Capacity
71.25

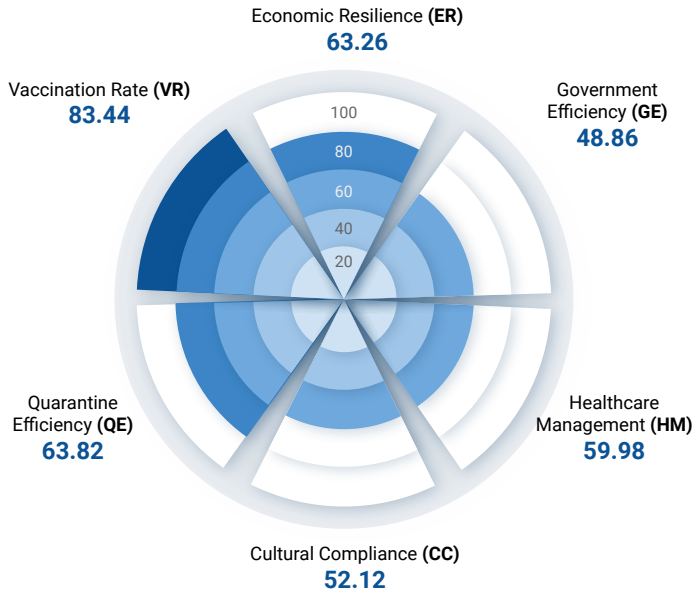
CC

Acceptance of Hierarchy
53.60
Degree of Social Interdependence
29.85
Risk Objection and Uncertainty Avoidance
56.72
Importance of Personal Freedom
88.10
Level of Prosperity and Life Opportunities
82.46
Strength of Social Norms
64.85

◇ Average score

Pandemic-Resilient Cities Ranking – Los Angeles

19/50



Overall Score – **61.91**/100

Los Angeles takes 19th place in the Pandemic-Resilient Cities Ranking. The city has demonstrated exceptional vaccination rates and has successfully mitigated the spread of the virus up to now. Although the city's economy grew in 2020, certain segments of the population were left to deal with the brunt of the crisis: over 66,000 individuals were experiencing homelessness on any given night in Los Angeles County. The city's income divide had severely impacted communities of colour, and the tension surrounding these racial inequities had started to boil over.

GE

Surveillance Practices
43.89
Public Involvement
62.82
Satisfaction With Government Performance
51.89
E-Readiness
70.42
Emergency Response Mechanism
18.13

ER

Resilient Capacity in Times of Crisis
60.72
Economic Resilience From Tourism Decline
63.44
Economy Rescue Package
39.68
Economy Vitality
76.98
Market Attractiveness
64.35
Wealth Indicator
77.33

QE

Prevention of COVID-19 Spread
64.35
COVID-19 Detection
69.13
City Preparedness for Pandemics
48.60
Post-COVID Strategy
82.03
Stringency of Containment Policy
49.32

HM

E-Health Score
94.45
Health System Resources
54.27
Healthcare COVID Response
70.75
Population Vulnerability
56.41
Public Health
40.11

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
62.15
Efficiency of Vaccine Allocation
100
Vaccine Production Capacity
70.76

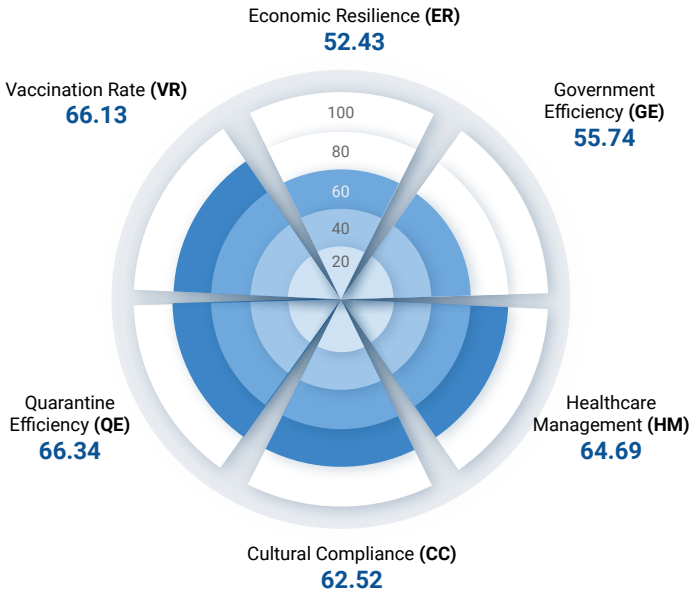
CC

Acceptance of Hierarchy
24.07
Degree of Social Interdependence
23.71
Risk Objection and Uncertainty Avoidance
26.16
Importance of Personal Freedom
87.11
Level of Prosperity and Life Opportunities
77.06
Strength of Social Norms
80.99

◇ Average score

Pandemic-Resilient Cities Ranking – Shanghai

20/50



Overall Score – **61.31**/100

Shanghai ranks 20th in the Pandemic-Resilient Cities Ranking. Although at the beginning of the pandemic, the 'zero community spread' strategy succeeded in containing the virus, this strategy is not currently working with the omicron variant. The number of new cases and deaths escalated in April, and the municipal government imposed strict containment measures, deepening the dissatisfaction of the city's population and creating serious logistical problems, with uneven access to food supply and medical treatment. The situation has led to some of the strongest levels of anti-government sentiment in years.

GE

- Surveillance Practices: 71.46
- Public Involvement: 97.66
- Satisfaction With Government Performance: 52.86
- E-Readiness: 51.71
- Emergency Response Mechanism: 24.92

ER

- Resilient Capacity in Times of Crisis: 50.07
- Economic Resilience From Tourism Decline: 54
- Economy Rescue Package: 25.34
- Economy Vitality: 38.45
- Market Attractiveness: 75.10
- Wealth Indicator: 77.21

QE

- Prevention of COVID-19 Spread: 46.41
- COVID-19 Detection: 67.01
- City Preparedness for Pandemics: 84.48
- Post-COVID Strategy: 87.41
- Stringency of Containment Policy: 51.90

HM

- E-Health Score: 93.09
- Health System Resources: 18.27
- Healthcare COVID Response: 80.02
- Population Vulnerability: 69.61
- Public Health: 76.65

VR

- Affordability of COVID-19 Vaccines: 49.80
- Deployment of COVID-19 Vaccines: 76.33
- Efficiency of Vaccine Allocation: 52.40
- Vaccine Production Capacity: 95.30

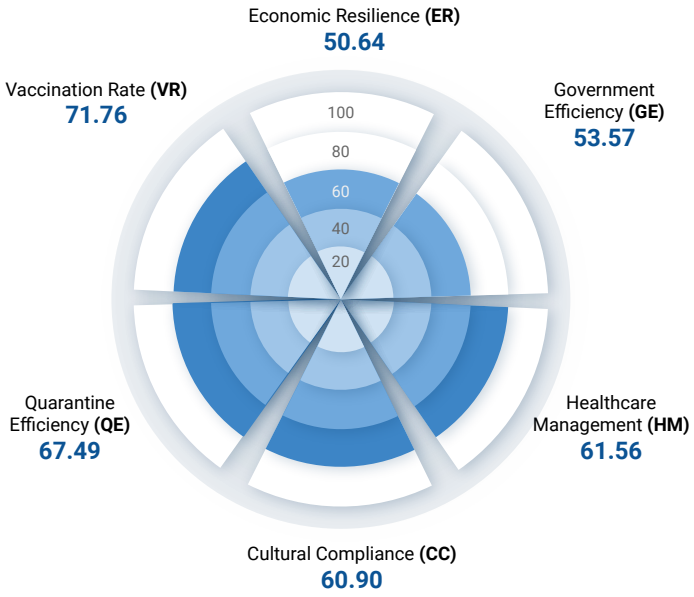
CC

- Acceptance of Hierarchy: 92.89
- Degree of Social Interdependence: 69.65
- Risk Objection and Uncertainty Avoidance: 51.95
- Importance of Personal Freedom: 30.78
- Level of Prosperity and Life Opportunities: 59.89
- Strength of Social Norms: 69.14

◇ Average score

Pandemic-Resilient Cities Ranking – Kuala Lumpur

21/50



Overall Score – **60.99**/100

Kuala Lumpur takes 21st place in the ranking. A strict Containment Policy and high levels of compliance in the population helped to contain the spread of the virus. Tourism plays an important role in the city's service-driven economy, which has experienced substantial losses during the pandemic. Although the local production of vaccines has been initiated in the city, most doses are still shipped from abroad. The government has also organised mobile centres for rural areas located 25 km away from a vaccination centre. During the pandemic, it took longer than average for the city to react to and contain the spread.

GE

Surveillance Practices
73.78

Public Involvement
79.35

Satisfaction With Government Performance
45.46

E-Readiness
61.79

Emergency Response Mechanism
21.93

ER

Resilient Capacity in Times of Crisis
27.22

Economic Resilience From Tourism Decline
38.13

Economy Rescue Package
20.81

Economy Vitality
47.21

Market Attractiveness
92.80

Wealth Indicator
78.83

QE

Prevention of COVID-19 Spread
58.09

COVID-19 Detection
69.60

City Preparedness for Pandemics
73.93

Post-COVID Strategy
56.30

Stringency of Containment Policy
83.11

HM

E-Health Score
94.38

Health System Resources
20.76

Healthcare COVID Response
71.90

Population Vulnerability
76.37

Public Health
59.75

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
73.04

Efficiency of Vaccine Allocation
63.49

Vaccine Production Capacity
47.73

CC

Acceptance of Hierarchy
84.65

Degree of Social Interdependence
49.17

Risk Objection and Uncertainty Avoidance
47.02

Importance of Personal Freedom
60.18

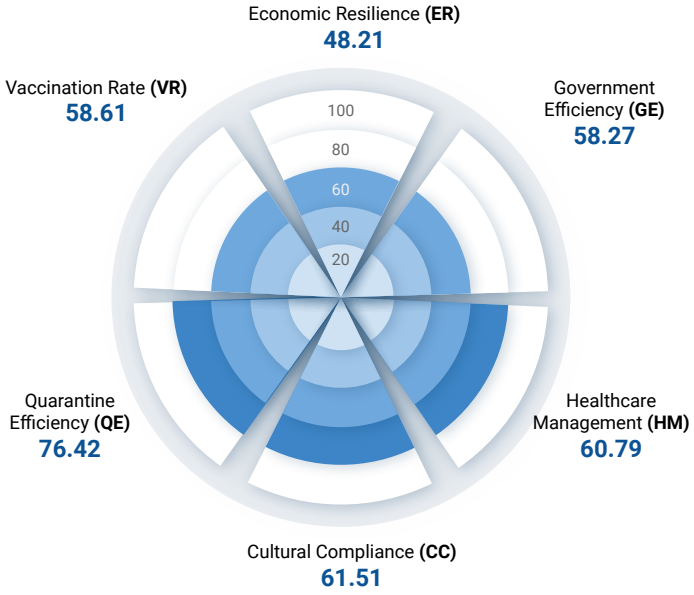
Level of Prosperity and Life Opportunities
63.38

Strength of Social Norms
53.94

◇ Average score

Pandemic-Resilient Cities Ranking – Riyadh

22/50



Overall Score – **60.64**/100

Riyadh takes 22nd place in the Ranking. The pandemic coincided with a significant drop in the global prices of crude oil, which contributes about 50% of the GDP of Saudi Arabia. The government invested more than 7% of GDP to alleviate the impact of COVID-19 on the economy and individuals. The most affected population groups included non-Saudi citizens, working in the private sector. There is no local vaccine production in the city, making it reliant on other countries for vaccine supply. The city's strict containment policy, combined with an authoritarian social structure, helped to contain the virus's spread.

GE

- Surveillance Practices: 57.64
- Public Involvement: 88.16
- Satisfaction With Government Performance: 51.88
- E-Readiness: 61.71
- Emergency Response Mechanism: 44.56

ER

- Resilient Capacity in Times of Crisis: 41.35
- Economic Resilience From Tourism Decline: 45.56
- Economy Rescue Package: 2.59
- Economy Vitality: 47.50
- Market Attractiveness: 85.21
- Wealth Indicator: 70.62

QE

- Prevention of COVID-19 Spread: 89.86
- COVID-19 Detection: 69.38
- City Preparedness for Pandemics: 58.87
- Post-COVID Strategy: 90.29
- Stringency of Containment Policy: 64.78

HM

- E-Health Score: 91.28
- Health System Resources: 23.14
- Healthcare COVID Response: 71.52
- Population Vulnerability: 91.93
- Public Health: 40.50

VR

- Affordability of COVID-19 Vaccines: 100
- Deployment of COVID-19 Vaccines: 60.83
- Efficiency of Vaccine Allocation: 51.38
- Vaccine Production Capacity: 12.80

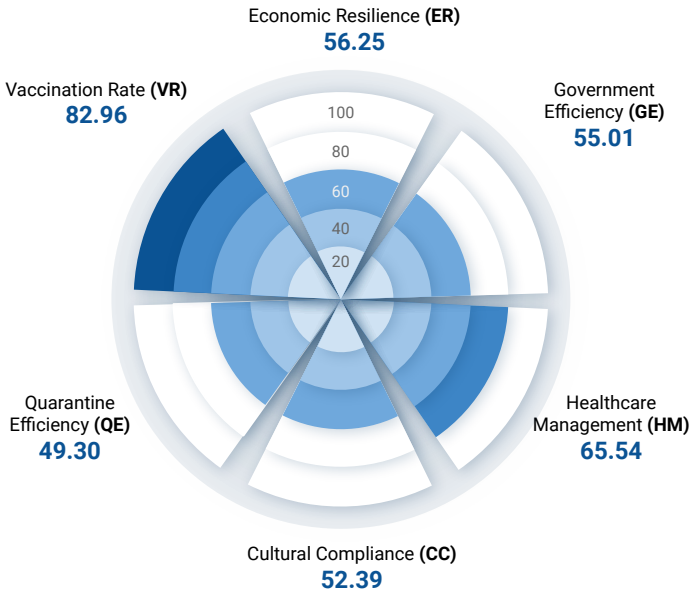
CC

- Acceptance of Hierarchy: 93.46
- Degree of Social Interdependence: 66.50
- Risk Objection and Uncertainty Avoidance: 61.37
- Importance of Personal Freedom: 25.70
- Level of Prosperity and Life Opportunities: 59.01
- Strength of Social Norms: 57.83

◇ Average score

Pandemic-Resilient Cities Ranking – London

23/50



Overall Score – **60.24**/100

London comes in 23rd in the Pandemic-Resilient Cities Ranking. Though the city's economy, particularly the service sector, experienced a significant shock, the municipal government was able to mitigate the effects successfully by targeting financial aid to the most vulnerable. There was also an eviction moratorium to protect citizens from losing shelter. The city has the full capacity to produce and distribute effective vaccines. As a cosmopolitan city, London has a population that is highly individualistic and values personal freedom, which was demonstrated by a number of anti-vaccine protests.

GE

Surveillance Practices
70.82

Public Involvement
62.35

Satisfaction With Government Performance
57.17

E-Readiness
71.20

Emergency Response Mechanism
17.74

ER

Resilient Capacity in Times of Crisis
61.21

Economic Resilience From Tourism Decline
49.61

Economy Rescue Package
23.79

Economy Vitality
56.03

Market Attractiveness
68.25

Wealth Indicator
81.42

QE

Prevention of COVID-19 Spread
33.74

COVID-19 Detection
71.17

City Preparedness for Pandemics
51.56

Post-COVID Strategy
54.32

Stringency of Containment Policy
40.95

HM

E-Health Score
96.26

Health System Resources
52.51

Healthcare COVID Response
76.47

Population Vulnerability
56.14

Public Health
60.86

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
59.59

Efficiency of Vaccine Allocation
100

Vaccine Production Capacity
72.87

CC

Acceptance of Hierarchy
23.88

Degree of Social Interdependence
28.85

Risk Objection and Uncertainty Avoidance
29.44

Importance of Personal Freedom
88.34

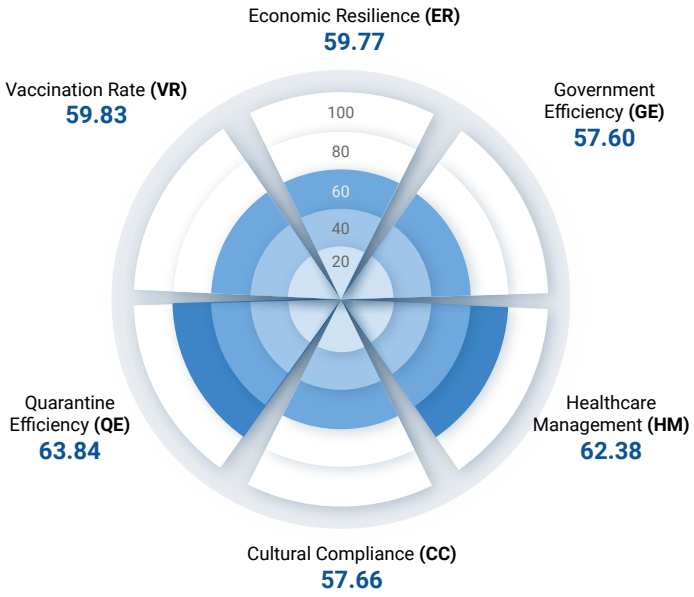
Level of Prosperity and Life Opportunities
80.89

Strength of Social Norms
68.91

◇ Average score

Pandemic-Resilient Cities Ranking – Wellington

24/50



Overall Score – **60.18**/100

Wellington, New Zealand ranks 24th in the Pandemic-Resilient Cities Ranking. Its economy was not hit as hard as the other cities in the country, due to the dominance of the public sector and major professional services. Vaccines are available to all residents; however, the city lacks the capacity to produce local vaccines. The municipal government, has expanded green spaces, community gardens, and 'slow street' infrastructure to adapt better to the post-COVID environment. The city observed several large-scale protests against vaccination and COVID-19 containment measure due to liberal and egalitarian culture.

GE

Surveillance Practices	57.64
Public Involvement	74.75
Satisfaction With Government Performance	66.20
E-Readiness	65.46
Emergency Response Mechanism	28.90

ER

Resilient Capacity in Times of Crisis	64.63
Economic Resilience From Tourism Decline	39.85
Economy Rescue Package	26.09
Economy Vitality	54.15
Market Attractiveness	89.58
Wealth Indicator	81.49

QE

Prevention of COVID-19 Spread	46.68
COVID-19 Detection	69.88
City Preparedness for Pandemics	71.05
Post-COVID Strategy	61.77
Stringency of Containment Policy	73.95

HM

E-Health Score	95.55
Health System Resources	39.97
Healthcare COVID Response	83.03
Population Vulnerability	55.24
Public Health	55

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	53.70
Efficiency of Vaccine Allocation	53.57
Vaccine Production Capacity	30.66

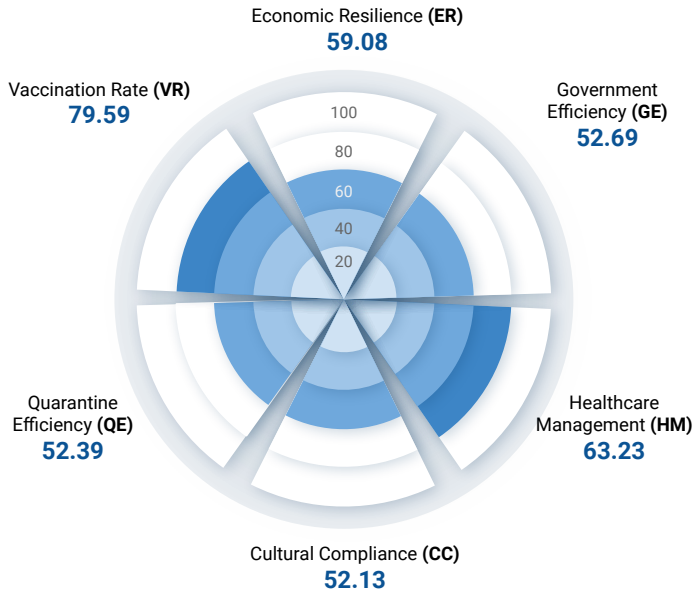
CC

Acceptance of Hierarchy	30.37
Degree of Social Interdependence	50.78
Risk Objection and Uncertainty Avoidance	27.13
Importance of Personal Freedom	94.57
Level of Prosperity and Life Opportunities	90.26
Strength of Social Norms	64.28

◇ Average score

Pandemic-Resilient Cities Ranking – Dublin

25/50



Overall Score – **59.85**/100

Dublin rounds off the Top 25 of the Pandemic-Resilient Cities Ranking. Vaccination is easily available and efficiently allocated, and the local authority's response to the COVID-19 threat was comprehensive and timely. Transparency, open data policies, the use of both traditional and social media to provide the public with evidence-based guidelines against the virus, and the high frequency of COVID-related updates resulted in high levels of public compliance and relatively low levels of spread. However, the city's economy was shaken due to its substantial reliance on tourism.

GE

Surveillance Practices
42.72

Public Involvement
68.78

Satisfaction With Government Performance
59.55

E-Readiness
69.31

Emergency Response Mechanism
25.68

ER

Resilient Capacity in Times of Crisis
33.94

Economic Resilience From Tourism Decline
56.98

Economy Rescue Package
39.40

Economy Vitality
52.35

Market Attractiveness
90.30

Wealth Indicator
86.23

QE

Prevention of COVID-19 Spread
56.30

COVID-19 Detection
70.08

City Preparedness for Pandemics
81.41

Post-COVID Strategy
46.58

Stringency of Containment Policy
22.58

HM

E-Health Score
88.95

Health System Resources
40.30

Healthcare COVID Response
75.25

Population Vulnerability
63.91

Public Health
60.32

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
76.51

Efficiency of Vaccine Allocation
87.89

Vaccine Production Capacity
41.48

CC

Acceptance of Hierarchy
25.10

Degree of Social Interdependence
31.20

Risk Objection and Uncertainty Avoidance
22.86

Importance of Personal Freedom
91.32

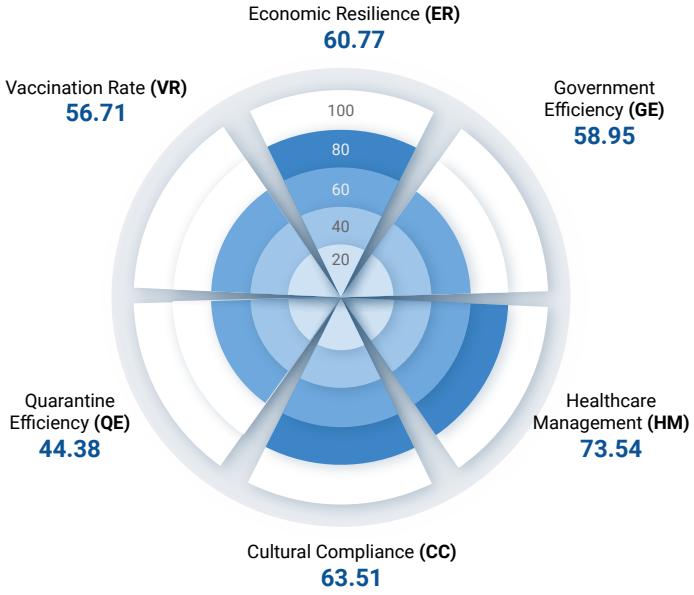
Level of Prosperity and Life Opportunities
84

Strength of Social Norms
65.74

◇ Average score

Pandemic-Resilient Cities Ranking – Bern

26/50



Overall Score – **59.64**/100

Bern, Switzerland comes in at 26th place. The government implemented an extended testing strategy along with a contact-tracing concept as it moved to ease social distancing measures. Though economic resilience is strong and the healthcare management of the region is exceptional, the city is not near the top of the ranking due to inefficient Efficiency of Vaccine Allocation and a lack of a well-thought-through post-COVID strategy. The high value placed on freedom in the city's culture led to several protests against restrictions on the unvaccinated. To date, only 70% of the population is fully vaccinated.

GE

- Surveillance Practices: 26.89
- Public Involvement: 84.03
- Satisfaction With Government Performance: 65.39
- E-Readiness: 69.31
- Emergency Response Mechanism: 51.98

ER

- Resilient Capacity in Times of Crisis: 41.92
- Economic Resilience From Tourism Decline: 48.07
- Economy Rescue Package: 39.42
- Economy Vitality: 62.84
- Market Attractiveness: 87.66
- Wealth Indicator: 84.99

QE

- Prevention of COVID-19 Spread: 47.94
- COVID-19 Detection: 69.61
- City Preparedness for Pandemics: 64.15
- Post-COVID Strategy: 24.01
- Stringency of Containment Policy: 30.31

HM

- E-Health Score: 96.70
- Health System Resources: 74.68
- Healthcare COVID Response: 81.32
- Population Vulnerability: 60.08
- Public Health: 65.83

VR

- Affordability of COVID-19 Vaccines: 80.72
- Deployment of COVID-19 Vaccines: 56.15
- Efficiency of Vaccine Allocation: 33.48
- Vaccine Production Capacity: 72.38

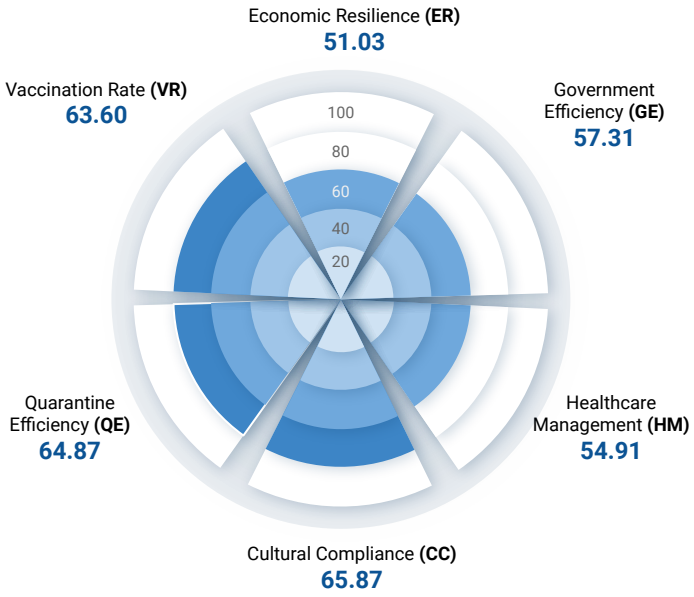
CC

- Acceptance of Hierarchy: 46.28
- Degree of Social Interdependence: 29.51
- Risk Objection and Uncertainty Avoidance: 44.40
- Importance of Personal Freedom: 95.45
- Level of Prosperity and Life Opportunities: 91.61
- Strength of Social Norms: 72.16

◇ Average score

Pandemic-Resilient Cities Ranking – Jakarta

27/50



Overall Score – **59.60**/100

Jakarta comes in at 27th place in the ranking. The government is continuing to implement its lockdown policy, known as the Community Activity Restrictions (PPKM) policy, for the foreseeable future, until the threat of the pandemic has been declared over. The containment measures are still in place, since only 60% of the population is vaccinated, and vaccines are not equally affordable in all areas. In addition, health system resources are now below adequate levels – healthcare spending per person is 20 times lower than the average of the 100 countries that were analyzed in this report.

GE

Surveillance Practices
57.80

Public Involvement
78.03

Satisfaction With Government Performance
67.41

E-Readiness
41.32

Emergency Response Mechanism
49.70

ER

Resilient Capacity in Times of Crisis
43.91

Economic Resilience From Tourism Decline
29.73

Economy Rescue Package
21.27

Economy Vitality
43.70

Market Attractiveness
95.31

Wealth Indicator
67.94

QE

Prevention of COVID-19 Spread
69.18

COVID-19 Detection
54.20

City Preparedness for Pandemics
48.60

Post-COVID Strategy
68.62

Stringency of Containment Policy
75.14

HM

E-Health Score
72.58

Health System Resources
7.86

Healthcare COVID Response
65.99

Population Vulnerability
68.59

Public Health
68.58

VR

Affordability of COVID-19 Vaccines
80.97

Deployment of COVID-19 Vaccines
55.56

Efficiency of Vaccine Allocation
74.09

Vaccine Production Capacity
35.21

CC

Acceptance of Hierarchy
84.24

Degree of Social Interdependence
78.52

Risk Objection and Uncertainty Avoidance
62.40

Importance of Personal Freedom
54.88

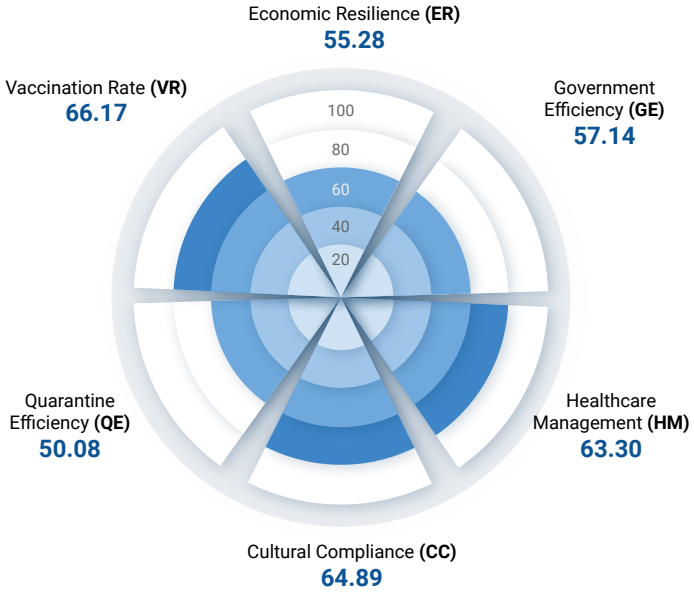
Level of Prosperity and Life Opportunities
55.06

Strength of Social Norms
59.75

◇ Average score

Pandemic-Resilient Cities Ranking – Paris

28/50



Overall Score – **59.48**/100

Paris comes in at 28th place in the ranking. France is one of the EU countries hit hardest by the pandemic, which exposed the structural weaknesses of the health system, including its governance and decision-making processes, but also created the impetus to implement the changes necessary to improve its resilience, with healthcare actors demonstrating high levels of innovation capacity as a result. To address the economic consequences of COVID-19, the French government created a €100 billion recovery plan, which, besides supporting businesses and rethinking production models, also aims to speed up the ecological transition.

GE

Surveillance Practices	61.73
Public Involvement	67.50
Satisfaction With Government Performance	54.41
E-Readiness	65.39
Emergency Response Mechanism	41.50

ER

Resilient Capacity in Times of Crisis	56.43
Economic Resilience From Tourism Decline	44.05
Economy Rescue Package	34.44
Economy Vitality	47.92
Market Attractiveness	70.80
Wealth Indicator	78.78

QE

Prevention of COVID-19 Spread	38.41
COVID-19 Detection	65.75
City Preparedness for Pandemics	48.60
Post-COVID Strategy	53.64
Stringency of Containment Policy	46.63

HM

E-Health Score	97.92
Health System Resources	47.83
Healthcare COVID Response	69.88
Population Vulnerability	54.94
Public Health	61.55

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	70.95
Efficiency of Vaccine Allocation	47.01
Vaccine Production Capacity	49.52

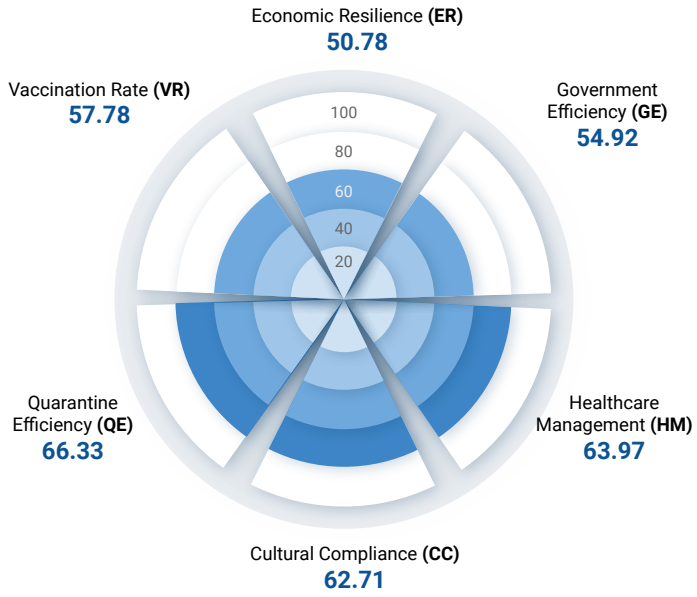
CC

Acceptance of Hierarchy	68.51
Degree of Social Interdependence	41.51
Risk Objection and Uncertainty Avoidance	55.54
Importance of Personal Freedom	80.92
Level of Prosperity and Life Opportunities	75.67
Strength of Social Norms	60.23

◇ Average score

Pandemic-Resilient Cities Ranking – Madrid

29/50



Overall Score – **59.41**/100

Madrid is ranked 29th in its overall score. With 84.3% of its population being fully vaccinated, Spain is in marking the transition into the endemic phase of the virus by no longer tracking COVID-19 cases among people below the age of 60. The lockdown interventions in Spain were considered to be among the strictest measures in Europe; however, while being initially successful in controlling the spread, they brought severe social and economic disruption. Spain's National Recovery and Resilience Plan (NRRP) identifies four lines of action to counteract the impact of the pandemic: green transition, digital transformation, social and territorial cohesion, and gender equality.

GE

Surveillance Practices
58.87

Public Involvement
49.93

Satisfaction With Government Performance
49.67

E-Readiness
67.82

Emergency Response Mechanism
47.01

ER

Resilient Capacity in Times of Crisis
29.26

Economic Resilience From Tourism Decline
40.08

Economy Rescue Package
45.08

Economy Vitality
45.71

Market Attractiveness
76.45

Wealth Indicator
67.64

QE

Prevention of COVID-19 Spread
50.97

COVID-19 Detection
72.13

City Preparedness for Pandemics
78.37

Post-COVID Strategy
76.21

Stringency of Containment Policy
59.07

HM

E-Health Score
97.43

Health System Resources
47.91

Healthcare COVID Response
74.89

Population Vulnerability
57.34

Public Health
57.98

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
62.83

Efficiency of Vaccine Allocation
38.78

Vaccine Production Capacity
28.95

CC

Acceptance of Hierarchy
54.54

Degree of Social Interdependence
51.89

Risk Objection and Uncertainty Avoidance
52.39

Importance of Personal Freedom
84.96

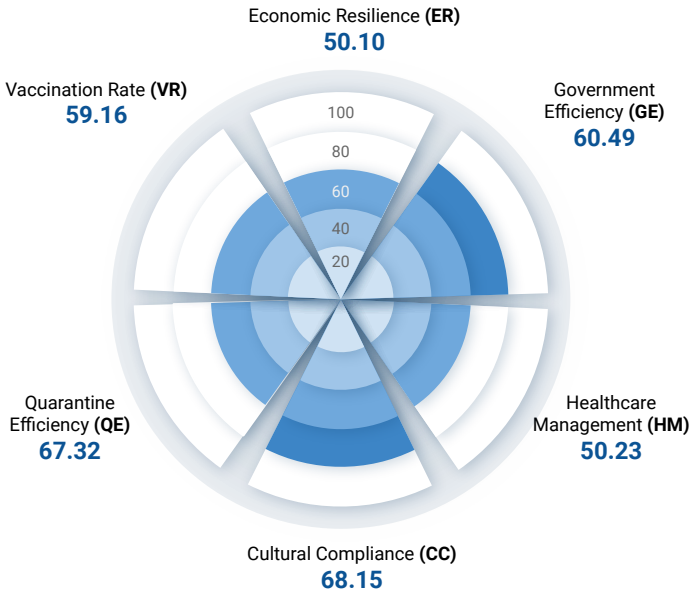
Level of Prosperity and Life Opportunities
71.12

Strength of Social Norms
61.41

◇ Average score

Pandemic-Resilient Cities Ranking – Doha

30/50



Overall Score – **59.24**/100

Doha, Qatar comes in at 30th place. Qatari citizens show very high levels of deference to authority, and the society has a widely accepted hierarchical structure. This led to widespread strict compliance with government restrictions, thus helping to contain the spread of the virus. Vaccines are generally affordable, though the city currently lacks the capacity to produce local vaccines. The recent collapse in the prices of natural resources negatively affected the city's economy, which relies primarily on revenue from the oil and natural gas industries. The Qatari economy ranked first in the Gulf Region in the COVID Economic Recovery Index.

GE

- Surveillance Practices: 57.64
- Public Involvement: 72.11
- Satisfaction With Government Performance: 63.11
- E-Readiness: 55.72
- Emergency Response Mechanism: 57.91

ER

- Resilient Capacity in Times of Crisis: 18.18
- Economic Resilience From Tourism Decline: 45.54
- Economy Rescue Package: 33.05
- Economy Vitality: 54.30
- Market Attractiveness: 66.70
- Wealth Indicator: 89.90

QE

- Prevention of COVID-19 Spread: 85.95
- COVID-19 Detection: 69.81
- City Preparedness for Pandemics: 48.60
- Post-COVID Strategy: 68.27
- Stringency of Containment Policy: 56.46

HM

- E-Health Score: 77.15
- Health System Resources: 11.87
- Healthcare COVID Response: 68.84
- Population Vulnerability: 67.85
- Public Health: 39.95

VR

- Affordability of COVID-19 Vaccines: 100
- Deployment of COVID-19 Vaccines: 65.79
- Efficiency of Vaccine Allocation: 54.50
- Vaccine Production Capacity: 0

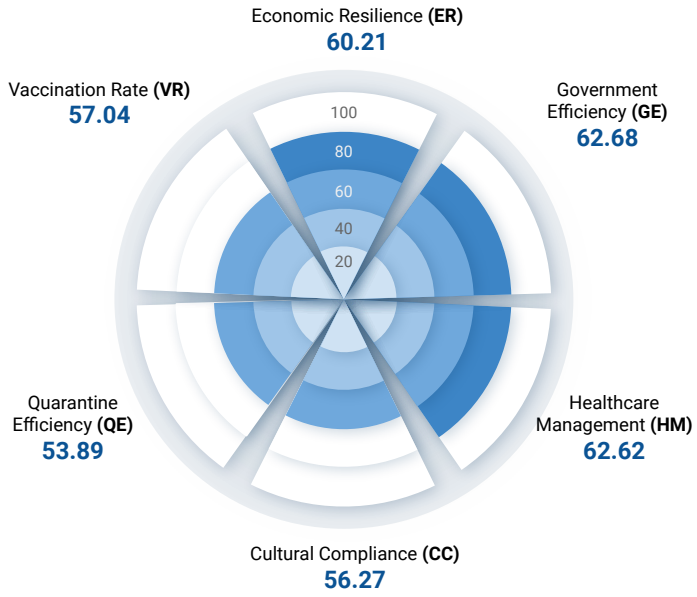
CC

- Acceptance of Hierarchy: 95.39
- Degree of Social Interdependence: 67.40
- Risk Objection and Uncertainty Avoidance: 70.55
- Importance of Personal Freedom: 42.45
- Level of Prosperity and Life Opportunities: 64.98
- Strength of Social Norms: 60.87

◇ Average score

Pandemic-Resilient Cities Ranking – Copenhagen

31/50



Overall Score – **58.78**/100

Copenhagen ranks 31st among the cities in the ranking. Denmark has a well-developed welfare state model, perfectly suited to handling the necessary operations of the state during a lockdown. The experience of the pandemic has only strengthened Denmark's high levels of public trust overall. The trusted eHealth Portal has been instrumental in delivering and ensuring access to health services, as well as increasing the digital health literacy of the population. With about 81% of its population fully vaccinated, Denmark has become the first country to suspend its COVID vaccination programme as the epidemic has been brought under control.

GE

Surveillance Practices
60.76
Public Involvement
82.44
Satisfaction With Government Performance
66.55
E-Readiness
76.42
Emergency Response Mechanism
33.28

ER

Resilient Capacity in Times of Crisis
64.48
Economic Resilience From Tourism Decline
47.90
Economy Rescue Package
16.10
Economy Vitality
59.14
Market Attractiveness
89.05
Wealth Indicator
85.22

QE

Prevention of COVID-19 Spread
58.07
COVID-19 Detection
77.93
City Preparedness for Pandemics
56.84
Post-COVID Strategy
67.08
Stringency of Containment Policy
15

HM

E-Health Score
98.03
Health System Resources
41.93
Healthcare COVID Response
81.76
Population Vulnerability
44.61
Public Health
64.41

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
76.35
Efficiency of Vaccine Allocation
21.27
Vaccine Production Capacity
32.19

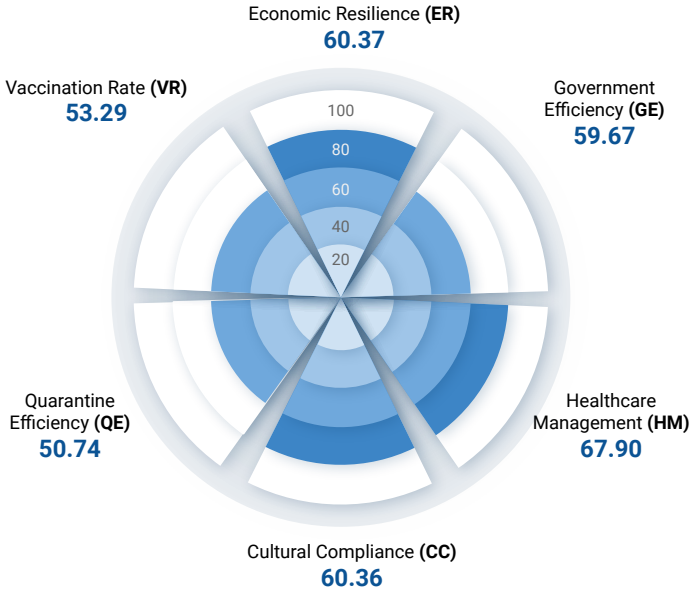
CC

Acceptance of Hierarchy
26.30
Degree of Social Interdependence
50.39
Risk Objection and Uncertainty Avoidance
20.66
Importance of Personal Freedom
92.99
Level of Prosperity and Life Opportunities
93.76
Strength of Social Norms
67.78

◇ Average score

Pandemic-Resilient Cities Ranking – Helsinki

32/50



Overall Score – **58.72**/100

Helsinki takes 32nd place among the Top 50 cities. Finland's COVID strategy was adapted based on situational circumstances and the immediate epidemiological situation. Public compliance with the interventions has been high as Finland has a well-known culture of being law-abiding. Ample test capacity, a high vaccination rate, robust healthcare resources, and a fast economic recovery due to the less stringent restrictions are important factors behind the success of the hybrid strategy adopted in Finland.

GE

- Surveillance Practices: 57.81
- Public Involvement: 88.15
- Satisfaction With Government Performance: 67.74
- E-Readiness: 76.85
- Emergency Response Mechanism: 16.46

ER

- Resilient Capacity in Times of Crisis: 65.97
- Economic Resilience From Tourism Decline: 44.46
- Economy Rescue Package: 22.11
- Economy Vitality: 51.03
- Market Attractiveness: 94.19
- Wealth Indicator: 83.37

QE

- Prevention of COVID-19 Spread: 36.44
- COVID-19 Detection: 69.94
- City Preparedness for Pandemics: 62.58
- Post-COVID Strategy: 57.76
- Stringency of Containment Policy: 35.08

HM

- E-Health Score: 96.55
- Health System Resources: 43.91
- Healthcare COVID Response: 91.39
- Population Vulnerability: 56.38
- Public Health: 66.62

VR

- Affordability of COVID-19 Vaccines: 100
- Deployment of COVID-19 Vaccines: 71.21
- Efficiency of Vaccine Allocation: 23.54
- Vaccine Production Capacity: 14.01

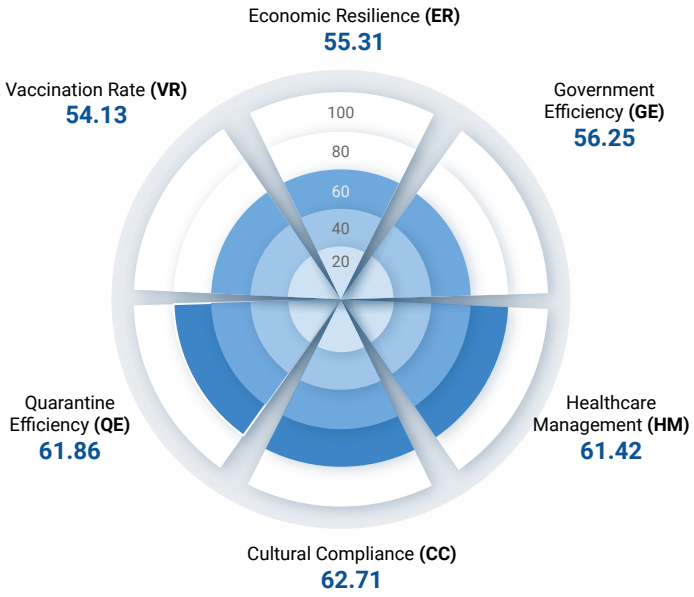
CC

- Acceptance of Hierarchy: 34.81
- Degree of Social Interdependence: 50.80
- Risk Objection and Uncertainty Avoidance: 36.99
- Importance of Personal Freedom: 90.31
- Level of Prosperity and Life Opportunities: 99.41
- Strength of Social Norms: 57.88

◇ Average score

Pandemic-Resilient Cities Ranking – Barcelona

33/50



Overall Score – **58.61**/100

Barcelona is placed 33rd in the ranking. Barcelona's response to the pandemic has been focused on correcting gender, class, and racial inequalities because of large contrasts in social conditions and high levels of poverty in some districts. Lockdowns, limitations on free movement, and restrictions on a range of activities have been implemented. Delayed information and updates reflected in the media sometimes spawned mistrust from citizens. Healthcare capacity is below adequate levels, with health facilities struggling with inadequate intensive care capacity in the worst-affected regions.

GE

Surveillance Practices
58.04
Public Involvement
61.40
Satisfaction With Government Performance
49.67
E-Readiness
67.82
Emergency Response Mechanism
47.01

ER

Resilient Capacity in Times of Crisis
51.87
Economic Resilience From Tourism Decline
40.41
Economy Rescue Package
45.08
Economy Vitality
45.71
Market Attractiveness
78.24
Wealth Indicator
67.64

QE

Prevention of COVID-19 Spread
52.21
COVID-19 Detection
71.99
City Preparedness for Pandemics
48.60
Post-COVID Strategy
73.93
Stringency of Containment Policy
59.07

HM

E-Health Score
97.43
Health System Resources
36.59
Healthcare COVID Response
74.89
Population Vulnerability
57.34
Public Health
57.98

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
67.80
Efficiency of Vaccine Allocation
26.49
Vaccine Production Capacity
20.32

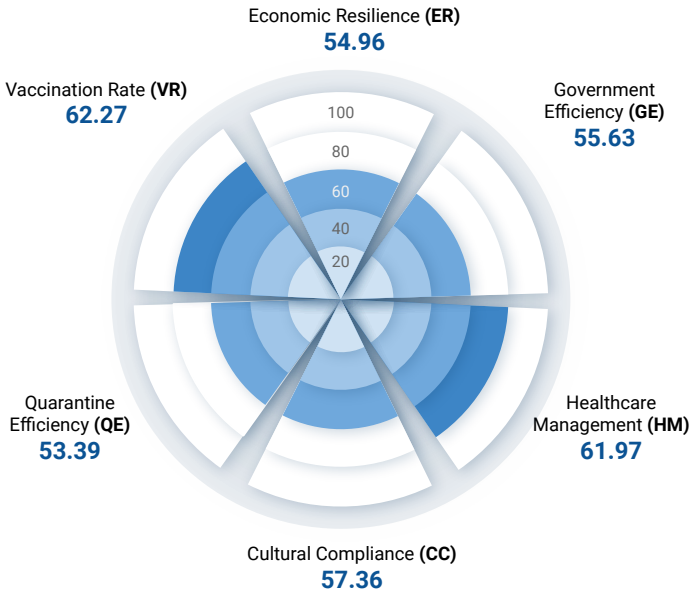
CC

Acceptance of Hierarchy
54.54
Degree of Social Interdependence
51.89
Risk Objection and Uncertainty Avoidance
52.39
Importance of Personal Freedom
84.96
Level of Prosperity and Life Opportunities
71.12
Strength of Social Norms
61.41

◇ Average score

Pandemic-Resilient Cities Ranking – Brussels

34/50



Overall Score – **57.59**/100

Brussels takes 34th place among the Top 50 cities in the ranking. Belgium has been hit harder by the coronavirus compared to the rest of Europe in terms of COVID-19 deaths. The country faced a shortage of personal protective equipment such as surgical masks and respirators. Belgium also observed demonstrations against covid restrictions. The country submitted its National Recovery and Resilience plan to Economic Commission, to make up for structural delay in public investment and accelerate the transition towards more inclusive growth, while reinforcing climate, social and economic resilience in the post covid world.

GE

Surveillance Practices	57.96
Public Involvement	65.22
Satisfaction With Government Performance	53.46
E-Readiness	61.24
Emergency Response Mechanism	44.48

ER

Resilient Capacity in Times of Crisis	53.78
Economic Resilience From Tourism Decline	43.21
Economy Rescue Package	11.56
Economy Vitality	50.37
Market Attractiveness	89.32
Wealth Indicator	82.92

QE

Prevention of COVID-19 Spread	47.49
COVID-19 Detection	69.79
City Preparedness for Pandemics	73.20
Post-COVID Strategy	52.72
Stringency of Containment Policy	34.69

HM

E-Health Score	96.21
Health System Resources	50.82
Healthcare COVID Response	65.54
Population Vulnerability	50.25
Public Health	62.10

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	66.66
Efficiency of Vaccine Allocation	31.21
Vaccine Production Capacity	65.19

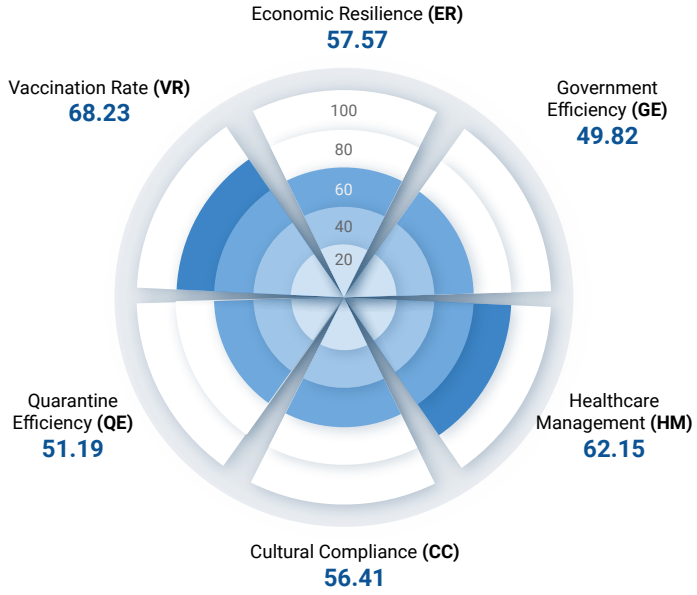
CC

Acceptance of Hierarchy	38.26
Degree of Social Interdependence	26.37
Risk Objection and Uncertainty Avoidance	61.01
Importance of Personal Freedom	84.94
Level of Prosperity and Life Opportunities	72.67
Strength of Social Norms	54.06

◇ Average score

Pandemic-Resilient Cities Ranking – Tel Aviv-Yafo

35/50



Overall Score – **57.56**/100

Tel Aviv-Yafo is ranked 35th in the Ranking. Like many countries, currently Israel rolls back its health restrictions. The score for health system resources is below average, as during the recent peak of cases a lack of testing cites created pressure on existing ones, forcing the government to revise its testing policy and assign PCR testing only for elderly and people at risk. With high rate of affordability of vaccines, the vaccination rate lags well behind developed countries - 66,6% are fully vaccinated. The tourism industry was brought to a standstill due to restrictions. A plan to assist the employees of the tourism industry was developed.

GE

Surveillance Practices
61.78
Public Involvement
60.41
Satisfaction With Government Performance
50.46
E-Readiness
62.16
Emergency Response Mechanism
19.66

ER

Resilient Capacity in Times of Crisis
50.30
Economic Resilience From Tourism Decline
38.16
Economy Rescue Package
39.19
Economy Vitality
51.62
Market Attractiveness
82.49
Wealth Indicator
81.48

QE

Prevention of COVID-19 Spread
61.63
COVID-19 Detection
70.12
City Preparedness for Pandemics
48.60
Post-COVID Strategy
41.97
Stringency of Containment Policy
37.35

HM

E-Health Score
95.88
Health System Resources
31.80
Healthcare COVID Response
77.60
Population Vulnerability
73.07
Public Health
48.83

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
56.89
Efficiency of Vaccine Allocation
56.02
Vaccine Production Capacity
72.97

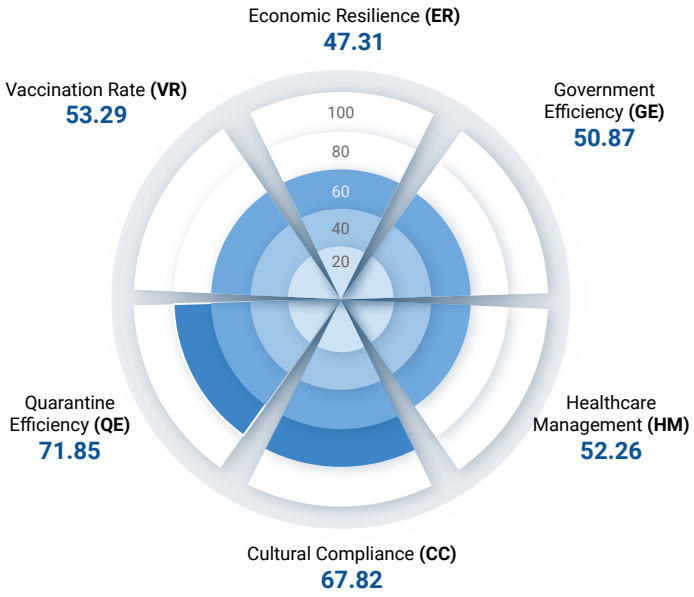
CC

Acceptance of Hierarchy
8.12
Degree of Social Interdependence
48.37
Risk Objection and Uncertainty Avoidance
70.88
Importance of Personal Freedom
70.03
Level of Prosperity and Life Opportunities
74.15
Strength of Social Norms
75.16

◇ Average score

Pandemic-Resilient Cities Ranking – Kuwait City

36/50



Overall Score – **57.23**/100

Kuwait City takes 36th place in the Ranking. Vaccines are readily available and 77% of the population is fully vaccinated. There is a high prevalence of obesity and other disorders among citizens, which makes them more vulnerable to pandemics. The city lacks capacity to produce local vaccines. Although the biggest part of the economy is revenue from oil, the government has encouraged the development of private sector, which was hit hardly during the pandemic. Most of the SMEs in Kuwait were operating with limited cash reserves even before the pandemic struck and were unable to weather a halt in operations due to lockdowns.

GE

- Surveillance Practices: 44.35
- Public Involvement: 71.96
- Satisfaction With Government Performance: 53.76
- E-Readiness: 63.04
- Emergency Response Mechanism: 27.31

ER

- Resilient Capacity in Times of Crisis: 33.43
- Economic Resilience From Tourism Decline: 26.34
- Economy Rescue Package: 16.76
- Economy Vitality: 48.16
- Market Attractiveness: 75.78
- Wealth Indicator: 83.07

QE

- Prevention of COVID-19 Spread: 85.75
- COVID-19 Detection: 70.02
- City Preparedness for Pandemics: 99.22
- Post-COVID Strategy: 69.53
- Stringency of Containment Policy: 44.64

HM

- E-Health Score: 40.29
- Health System Resources: 21.23
- Healthcare COVID Response: 76.43
- Population Vulnerability: 87.23
- Public Health: 34.16

VR

- Affordability of COVID-19 Vaccines: 80.72
- Deployment of COVID-19 Vaccines: 61.72
- Efficiency of Vaccine Allocation: 52.89
- Vaccine Production Capacity: 0

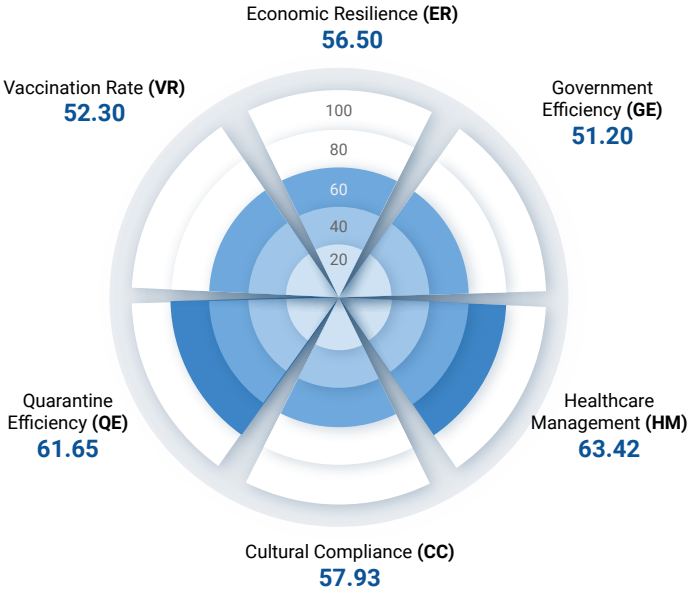
CC

- Acceptance of Hierarchy: 94.33
- Degree of Social Interdependence: 71.80
- Risk Objection and Uncertainty Avoidance: 77.14
- Importance of Personal Freedom: 46.73
- Level of Prosperity and Life Opportunities: 57.53
- Strength of Social Norms: 50.71

◇ Average score

Pandemic-Resilient Cities Ranking – Stockholm

37/50



Overall Score – **57.17**/100

Stockholm comes in at 37th place. In contrast to the widespread lockdowns across much of the rest of the world, Sweden adopted a largely voluntary approach that included promoting social distancing and good hygiene. Sweden's mortality rate from COVID-19 remains among the lowest in Europe, while levels of institutional and interpersonal trust remain high. Unlike many other countries, Sweden has not observed large-scale protests against COVID-19 restrictions. All such restrictions were lifted on 9 February 2022, and Sweden no longer classifies COVID-19 as a critical illness.

GE

Surveillance Practices
45.99

Public Involvement
77.30

Satisfaction With Government Performance
65.99

E-Readiness
72.53

Emergency Response Mechanism

ER

Resilient Capacity in Times of Crisis
60.63

Economic Resilience From Tourism Decline
46.95

Economy Rescue Package
8.03

Economy Vitality
54.98

Market Attractiveness
89.48

Wealth Indicator
80.25

QE

Prevention of COVID-19 Spread
78.59

COVID-19 Detection
69.94

City Preparedness for Pandemics
53.59

Post-COVID Strategy
82.73

Stringency of Containment Policy
20.85

HM

E-Health Score
94.25

Health System Resources
44.13

Healthcare COVID Response
77.50

Population Vulnerability
50.67

Public Health
65.58

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
67.95

Efficiency of Vaccine Allocation
3.78

Vaccine Production Capacity
54.20

CC

Acceptance of Hierarchy
33.57

Degree of Social Interdependence
54.53

Risk Objection and Uncertainty Avoidance
25.48

Importance of Personal Freedom
89.21

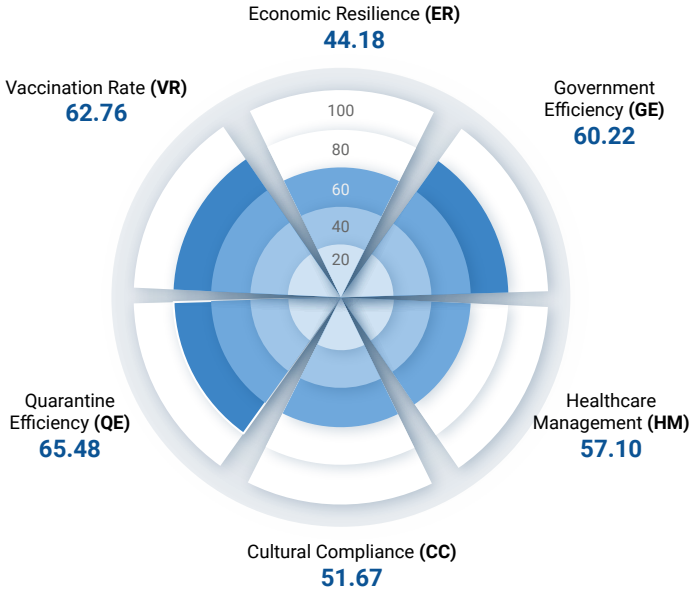
Level of Prosperity and Life Opportunities
93.96

Strength of Social Norms
63.28

◇ Average score

Pandemic-Resilient Cities Ranking – Sao Paulo

38/50



Overall Score – **56.90**/100

Sao Paulo takes 38th place in the ranking. The city has achieved success in containing the virus due to very stringent containment measures and overall compliance of the citizens. Regarding the economy, even before the crisis struck, Brazil's recovery from the 2015–16 recession was fragile, and its fiscal space was limited. In addition, as a net oil exporter, Brazil has also been hit by the oil price shock. Moreover, the pandemic added pressure to the already overcrowded public health care system, and endanger more lives, particularly among the poor and vulnerable.

GE

Surveillance Practices	69.62
Public Involvement	41.19
Satisfaction With Government Performance	61.69
E-Readiness	47.53
Emergency Response Mechanism	75.66

ER

Resilient Capacity in Times of Crisis	32.41
Economic Resilience From Tourism Decline	18.41
Economy Rescue Package	26.27
Economy Vitality	36.86
Market Attractiveness	90.99
Wealth Indicator	52.49

QE

Prevention of COVID-19 Spread	58.68
COVID-19 Detection	40.95
City Preparedness for Pandemics	73.93
Post-COVID Strategy	64.28
Stringency of Containment Policy	87.45

HM

E-Health Score	90.31
Health System Resources	26.23
Healthcare COVID Response	62.42
Population Vulnerability	70.98
Public Health	50.41

VR

Affordability of COVID-19 Vaccines	80.72
Deployment of COVID-19 Vaccines	68.32
Efficiency of Vaccine Allocation	53.57
Vaccine Production Capacity	45.85

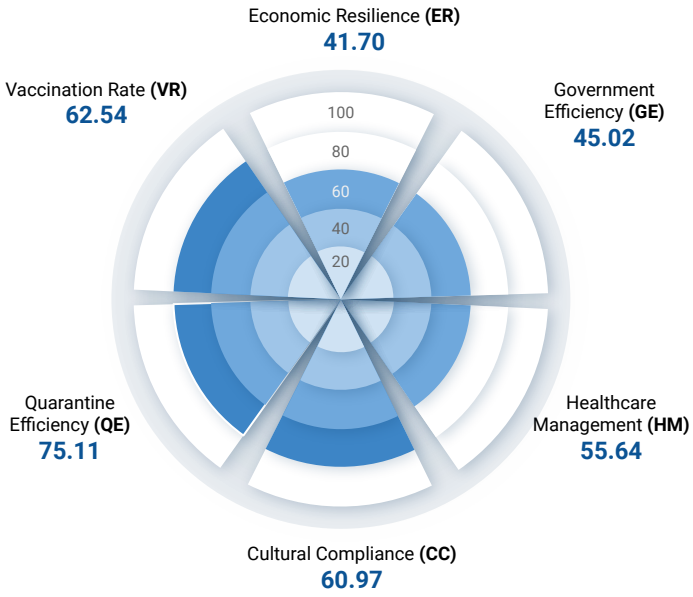
CC

Acceptance of Hierarchy	58.81
Degree of Social Interdependence	44.67
Risk Objection and Uncertainty Avoidance	43.68
Importance of Personal Freedom	56.19
Level of Prosperity and Life Opportunities	57.58
Strength of Social Norms	46.33

◇ Average score

Pandemic-Resilient Cities Ranking – Manila

39/50



Overall Score – **56.83**/100

Manila comes in at 39th place. The Philippines acted quickly to combat the virus imposing Enhanced Community Quarantine (ECQ) in Manila and other high-risk regions. The country implemented a set of support measures for households and businesses to help navigate the ECQ, such as an emergency subsidy programme for Filipino families and wage supplements to employees of small businesses. The economic challenge was faced by tourism industry, which comprises a substantial part of the economy.In addition, the health system wasn't prepared for an emergency: there was a shortage of hospital beds, medical staff and funding in general.

GE

Surveillance Practices
58.09
Public Involvement
62.04
Satisfaction With Government Performance
32.26
E-Readiness
35.76
Emergency Response Mechanism
48.55

ER

Resilient Capacity in Times of Crisis
23.14
Economic Resilience From Tourism Decline
22.57
Economy Rescue Package
2.42
Economy Vitality
38.51
Market Attractiveness
96.65
Wealth Indicator
64.59

QE

Prevention of COVID-19 Spread
71.91
COVID-19 Detection
66.52
City Preparedness for Pandemics
73.93
Post-COVID Strategy
78.95
Stringency of Containment Policy
81.68

HM

E-Health Score
93.41
Health System Resources
12.22
Healthcare COVID Response
67.57
Population Vulnerability
63.13
Public Health
59.56

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
52.18
Efficiency of Vaccine Allocation
74.26
Vaccine Production Capacity
9.21

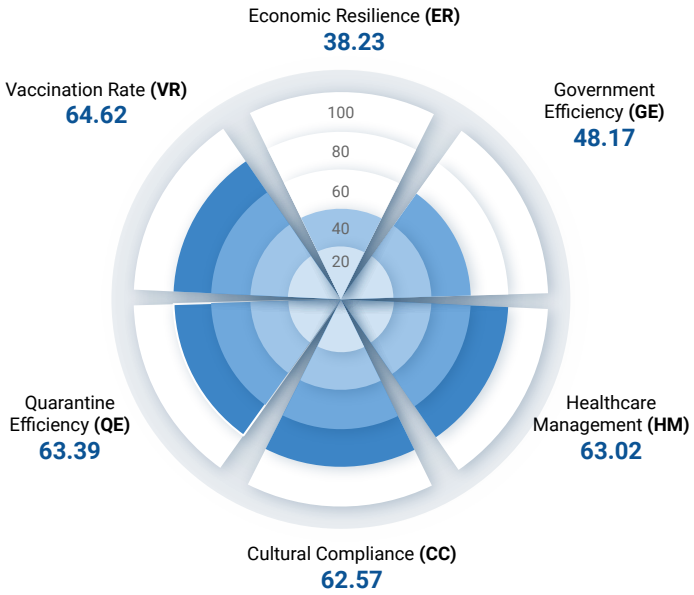
CC

Acceptance of Hierarchy
89.93
Degree of Social Interdependence
67.75
Risk Objection and Uncertainty Avoidance
33.25
Importance of Personal Freedom
50.72
Level of Prosperity and Life Opportunities
63.80
Strength of Social Norms
62.19

◇ Average score

Pandemic-Resilient Cities Ranking – New Delhi

40/50



Overall Score – **56.67**/100

New Delhi ranks 40th among the Top 50. Informal workers comprise 80% of the labor force in New Delhi. This part of the population is known to be the most vulnerable group during crisis. A substantial part of the population of the city is experiencing food insecurity, rising debts and falling income, and government support is failing to alleviate their situation. Another major issue is the inadequate level of healthcare resources - the healthcare system is severely underfunded, a shortage of hospital beds and medical staff is observed.

GE

- Surveillance Practices: 61.50
- Public Involvement: 86.04
- Satisfaction With Government Performance: 68.21
- E-Readiness: 23.36
- Emergency Response Mechanism: 17.49

ER

- Resilient Capacity in Times of Crisis: 22.37
- Economic Resilience From Tourism Decline: 29.50
- Economy Rescue Package: 7.32
- Economy Vitality: 37.37
- Market Attractiveness: 82.42
- Wealth Indicator: 49.49

QE

- Prevention of COVID-19 Spread: 63.89
- COVID-19 Detection: 66.82
- City Preparedness for Pandemics: 73.93
- Post-COVID Strategy: 74.67
- Stringency of Containment Policy: 41.55

HM

- E-Health Score: 92.82
- Health System Resources: 7.37
- Healthcare COVID Response: 76.20
- Population Vulnerability: 79.42
- Public Health: 73.75

VR

- Affordability of COVID-19 Vaccines: 50.06
- Deployment of COVID-19 Vaccines: 55.68
- Efficiency of Vaccine Allocation: 72.92
- Vaccine Production Capacity: 85.62

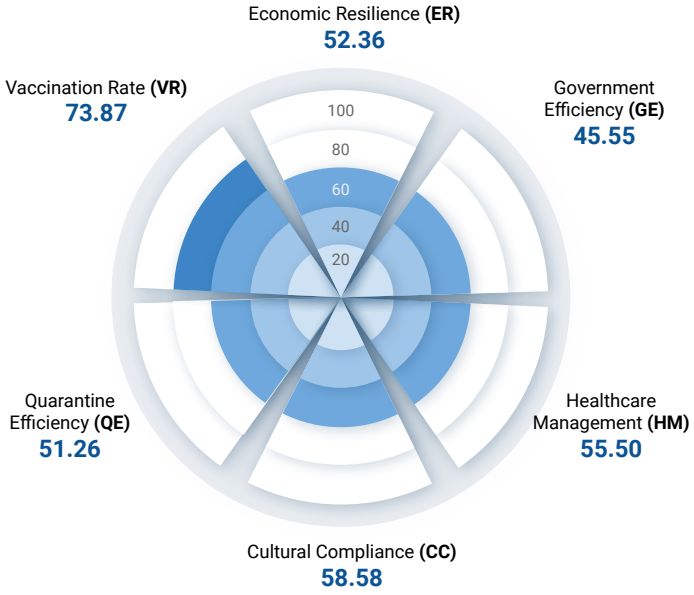
CC

- Acceptance of Hierarchy: 82.82
- Degree of Social Interdependence: 65.23
- Risk Objection and Uncertainty Avoidance: 60.08
- Importance of Personal Freedom: 37.71
- Level of Prosperity and Life Opportunities: 40.40
- Strength of Social Norms: 89.06

◇ Average score

Pandemic-Resilient Cities Ranking – Rome

41/50



Overall Score – **56.19**/100

Rome ranks 41st in the Pandemic-Resilient Cities Ranking. The government supplied vaccines efficiently to all the residents, giving priority to the most vulnerable groups. The city has been undergoing a period of healthcare reorganization in recent years, leading to human resource shortages, regional disparities in the quality of services, an ageing workforce, delays in digitisation, and inadequate budgets for preventive measures. This led to the complete unpreparedness of the health sector to face the COVID-19 crisis and, as a result, there were inadequate measures of protection against infection for patients and the elderly.

GE

Surveillance Practices
28.40

Public Involvement
70.73

Satisfaction With Government Performance
44.77

E-Readiness
59.72

Emergency Response Mechanism
30.46

ER

Resilient Capacity in Times of Crisis
44.52

Economic Resilience From Tourism Decline
38.58

Economy Rescue Package
45.49

Economy Vitality
37.57

Market Attractiveness
74.58

Wealth Indicator
72.56

QE

Prevention of COVID-19 Spread
38.24

COVID-19 Detection
69.31

City Preparedness for Pandemics
90.97

Post-COVID Strategy
39.15

Stringency of Containment Policy
38.07

HM

E-Health Score
66.89

Health System Resources
32.55

Healthcare COVID Response
68.18

Population Vulnerability
52.86

Public Health
63.55

VR

Affordability of COVID-19 Vaccines
100

Deployment of COVID-19 Vaccines
77.32

Efficiency of Vaccine Allocation
52.40

Vaccine Production Capacity
74.94

CC

Acceptance of Hierarchy
59.99

Degree of Social Interdependence
29.35

Risk Objection and Uncertainty Avoidance
56.45

Importance of Personal Freedom
82.42

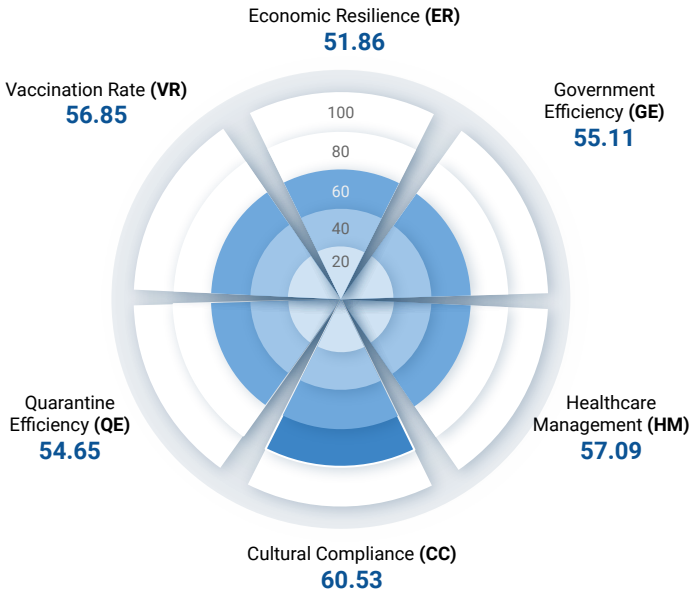
Level of Prosperity and Life Opportunities
60.40

Strength of Social Norms
52.07

◇ Average score

Pandemic-Resilient Cities Ranking – Santiago

42/50



Overall Score – **56.01**/100

Santiago, Chile takes 42nd place in the Pandemic-Resilient Cities Ranking. The government of Chile reacted swiftly to the pandemic by adopting social distancing and targeted lockdown measures as well as fiscal and monetary measures to protect the most vulnerable and to preserve human productive and financial capacities to enable a return to normality and avoid hysteresis once measures were lifted. Vaccination rates are also extremely high – 91% of the country population is fully vaccinated. Unfortunately, the overall economic situation and the continued impact of the huge social protests cause the city to lag behind in the rankings.

GE

Surveillance Practices
58.05

Public Involvement
30.12

Satisfaction With Government Performance
81.41

E-Readiness
59.44

Emergency Response Mechanism
32.65

ER

Resilient Capacity in Times of Crisis
43.12

Economic Resilience From Tourism Decline
35.07

Economy Rescue Package
7.98

Economy Vitality
56.42

Market Attractiveness
92.42

Wealth Indicator
74.70

QE

Prevention of COVID-19 Spread
55.44

COVID-19 Detection
68.88

City Preparedness for Pandemics
48.60

Post-COVID Strategy
41.64

Stringency of Containment Policy
60.39

HM

E-Health Score
92.63

Health System Resources
25.18

Healthcare COVID Response
58.64

Population Vulnerability
72.43

Public Health
51.92

VR

Affordability of COVID-19 Vaccines
61.68

Deployment of COVID-19 Vaccines
85.19

Efficiency of Vaccine Allocation
47.01

Vaccine Production Capacity
12.78

CC

Acceptance of Hierarchy
46.78

Degree of Social Interdependence
60.54

Risk Objection and Uncertainty Avoidance
57.31

Importance of Personal Freedom
80.79

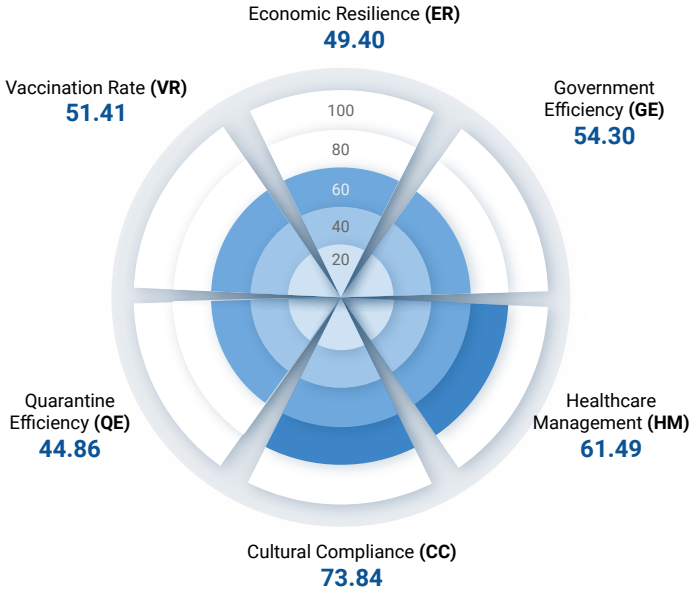
Level of Prosperity and Life Opportunities
59.24

Strength of Social Norms
61.81

◇ Average score

Pandemic-Resilient Cities Ranking – Taipei

43/50



Overall Score – **55.88**/100

Taipei takes 43rd place in the ranking. Taiwan's 'precision-prevention' strategic model, which included tight border controls and a strict quarantine policy, contributed to the country's early success in fighting COVID-19. Financial measures for individuals and companies affected by the spread of the virus have been another contributor to Taiwan's economic expansion and growth during the pandemic. Nonetheless, Taiwan's COVID-19 economic relief budget, as a percentage of GDP (4% in 2021), is low compared to other developed countries. In May 2022, the nation battled its most serious outbreak of cases to date, with about 80% of its population being double-vaccinated.

GE

- Surveillance Practices: 59.08
- Public Involvement: 46.06
- Satisfaction With Government Performance: 89.31
- E-Readiness: 65.64
- Emergency Response Mechanism: 2.70

ER

- Resilient Capacity in Times of Crisis: 19.48
- Economic Resilience From Tourism Decline: 35.27
- Economy Rescue Package: 16.06
- Economy Vitality: 55.57
- Market Attractiveness: 80.77
- Wealth Indicator: 92.98

QE

- Prevention of COVID-19 Spread: 55.32
- COVID-19 Detection: 69.56
- City Preparedness for Pandemics: 73.93
- Post-COVID Strategy: 8.72
- Stringency of Containment Policy: 35.24

HM

- E-Health Score: 100
- Health System Resources: 14.87
- Healthcare COVID Response: 60.46
- Population Vulnerability: 65.20
- Public Health: 83.24

VR

- Affordability of COVID-19 Vaccines: 69.09
- Deployment of COVID-19 Vaccines: 47.74
- Efficiency of Vaccine Allocation: 47.01
- Vaccine Production Capacity: 48.83

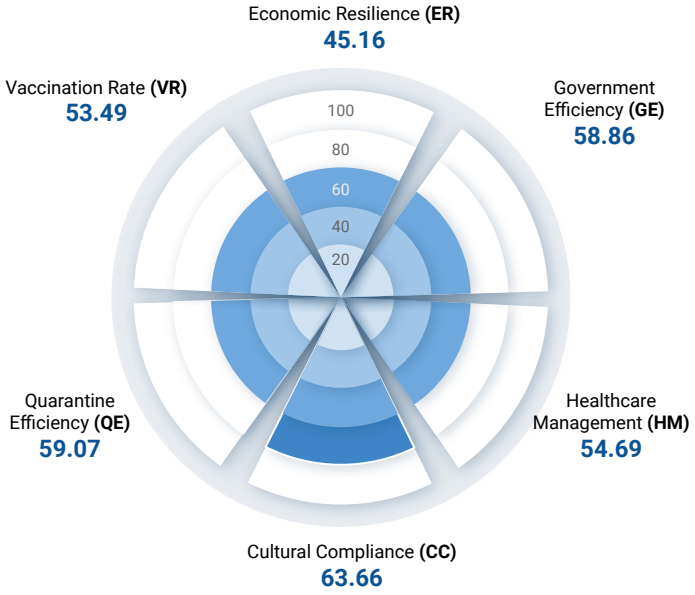
CC

- Acceptance of Hierarchy: 60.67
- Degree of Social Interdependence: 68.78
- Risk Objection and Uncertainty Avoidance: 74.97
- Importance of Personal Freedom: 91.03
- Level of Prosperity and Life Opportunities: 73.83
- Strength of Social Norms: 74.49

◇ Average score

Pandemic-Resilient Cities Ranking – Lisbon

44/50



Overall Score – **55.82**/100

Lisbon is ranked 44th among the Top 50 cities. The city has been relatively successful in controlling the virus's spread, but the economy and healthcare are quite vulnerable to shocks such as the impact of the pandemic. These sectors need more coordinated action by the government to prevent collapse as well as to recover from damage. The city has achieved success in immunising its residents – 91% of the population is fully vaccinated. However, the city relies on importing vaccines as it lacks the capacity to produce its own.

GE

Surveillance Practices	43.87
Public Involvement	79.56
Satisfaction With Government Performance	79
E-Readiness	62.32
Emergency Response Mechanism	31.86

ER

Resilient Capacity in Times of Crisis	28.14
Economic Resilience From Tourism Decline	34.56
Economy Rescue Package	5.96
Economy Vitality	46.90
Market Attractiveness	83.37
Wealth Indicator	74.01

QE

Prevention of COVID-19 Spread	71.55
COVID-19 Detection	70.65
City Preparedness for Pandemics	73.93
Post-COVID Strategy	49.22
Stringency of Containment Policy	38.67

HM

E-Health Score	59.35
Health System Resources	36.07
Healthcare COVID Response	71.74
Population Vulnerability	54.39
Public Health	56.16

VR

Affordability of COVID-19 Vaccines	100
Deployment of COVID-19 Vaccines	67.44
Efficiency of Vaccine Allocation	34.90
Vaccine Production Capacity	0

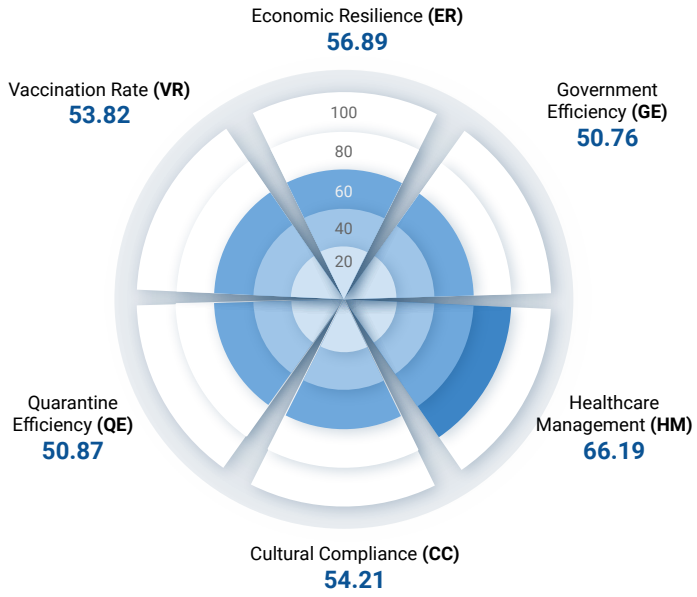
CC

Acceptance of Hierarchy	56.68
Degree of Social Interdependence	67.60
Risk Objection and Uncertainty Avoidance	54.06
Importance of Personal Freedom	85.85
Level of Prosperity and Life Opportunities	74.90
Strength of Social Norms	45.19

◇ Average score

Pandemic-Resilient Cities Ranking – Vienna

45/50



Overall Score – **55.46**/100

Vienna is ranked 45th in the Pandemic-Resilient Cities Ranking. In response to the first case, the government imposed travel restrictions and self-quarantine for symptomatic people. Other measures were not enough in order to hold the virus spread having more than 4 millions cases in total for full period. The last surge of COVID-19 was caused by relaxing measures due to omicron being less dangerous than previous variants. Though the peak was twice higher than any of the previous ones, sufficient vaccination rate in parallel with restrictions for unvaccinated citizens worked well to prevent an increase in mortality.

GE

Surveillance Practices
27.54
Public Involvement
62.64
Satisfaction With Government Performance
56.23
E-Readiness
72.59
Emergency Response Mechanism
33.36

ER

Resilient Capacity in Times of Crisis
41.19
Economic Resilience From Tourism Decline
43.47
Economy Rescue Package
40.86
Economy Vitality
47.43
Market Attractiveness
85.60
Wealth Indicator
83.27

QE

Prevention of COVID-19 Spread
52.45
COVID-19 Detection
76.77
City Preparedness for Pandemics
57.14
Post-COVID Strategy
30.73
Stringency of Containment Policy
46.49

HM

E-Health Score
96.70
Health System Resources
48.70
Healthcare COVID Response
74.87
Population Vulnerability
63.88
Public Health
60.98

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
67.31
Efficiency of Vaccine Allocation
35.65
Vaccine Production Capacity
0.85

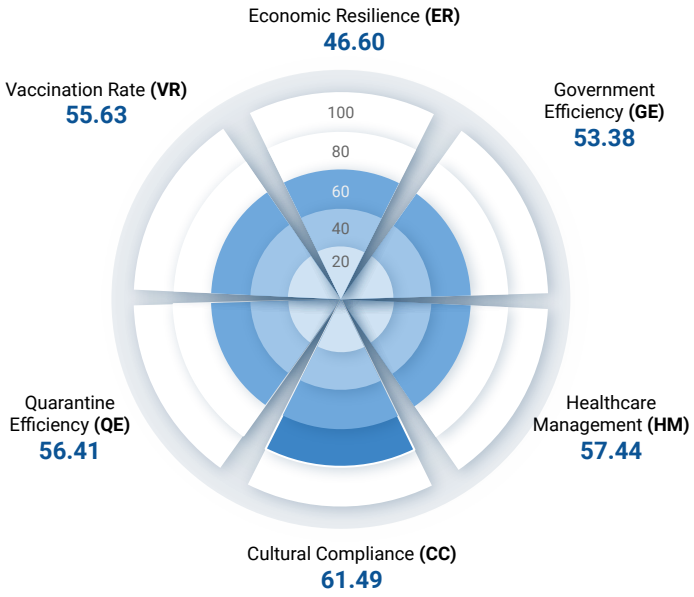
CC

Acceptance of Hierarchy
17.57
Degree of Social Interdependence
34.25
Risk Objection and Uncertainty Avoidance
45.16
Importance of Personal Freedom
86.64
Level of Prosperity and Life Opportunities
83.37
Strength of Social Norms
63.60

◇ Average score

Pandemic-Resilient Cities Ranking – Hong Kong

46/50



Overall Score – **55.16**/100

Hong Kong comes in at 46th place. Through several past experiences of SARS outbreaks, government public health and residents were better prepared for possible threats. The government implemented numerous strict measures even before the first local COVID-19 case was discovered. However, on the beginning of 2022 Hong Kong's zero-COVID strategy and uneven vaccination drive has left the population vulnerable to the omicron variant. Having high population density, it was difficult to control the spread of omicron. The surge has overwhelmed Hong Kong's isolation facilities.

GE

- Surveillance Practices: 62.54
- Public Involvement: 67.56
- Satisfaction With Government Performance: 45.72
- E-Readiness: 60.27
- Emergency Response Mechanism: 38.77

ER

- Resilient Capacity in Times of Crisis: 0.49
- Economic Resilience From Tourism Decline: 55.09
- Economy Rescue Package: 25.29
- Economy Vitality: 37.85
- Market Attractiveness: 81.09
- Wealth Indicator: 92.07

QE

- Prevention of COVID-19 Spread: 63.49
- COVID-19 Detection: 71.30
- City Preparedness for Pandemics: 73.93
- Post-COVID Strategy: 17.43
- Stringency of Containment Policy: 68.14

HM

- E-Health Score: 93.33
- Health System Resources: 8.32
- Healthcare COVID Response: 58.83
- Population Vulnerability: 55.44
- Public Health: 86.83

VR

- Affordability of COVID-19 Vaccines: 80.72
- Deployment of COVID-19 Vaccines: 44.68
- Efficiency of Vaccine Allocation: 68.38
- Vaccine Production Capacity: 18.18

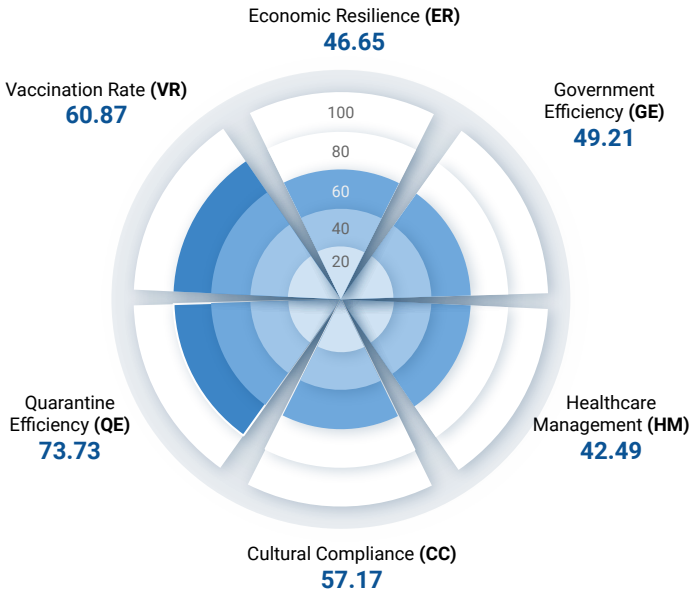
CC

- Acceptance of Hierarchy: 51.57
- Degree of Social Interdependence: 55.40
- Risk Objection and Uncertainty Avoidance: 61.94
- Importance of Personal Freedom: 84.42
- Level of Prosperity and Life Opportunities: 57.36
- Strength of Social Norms: 57.02

◇ Average score

Pandemic-Resilient Cities Ranking – Lima

47/50



Overall Score – **55.02**/100

Lima ranks 47th in the Pandemic-Resilient Cities Ranking. Peru has the highest number of deaths from COVID-19 per capita. Although the Peruvian government imposed one of the earliest and strictest lockdowns, infections and deaths continued to rise. About 70% of the employed population in Peru works in the informal sector and many workers have to choose between going to work or not having enough money to live.The government passed significant support measures to help people – and companies who lost their income – but only about 38% of Peruvian adults have a bank account, making quick digital payments largely impossible.

GE

Surveillance Practices
57.80

Public Involvement
46.30

Satisfaction With Government Performance
59.67

E-Readiness
45.45

Emergency Response Mechanism
35.69

ER

Resilient Capacity in Times of Crisis
18.21

Economic Resilience From Tourism Decline
25.81

Economy Rescue Package
26.12

Economy Vitality
48.83

Market Attractiveness
93.20

Wealth Indicator
63.59

QE

Prevention of COVID-19 Spread
76.53

COVID-19 Detection
68.41

City Preparedness for Pandemics
64.97

Post-COVID Strategy
69.22

Stringency of Containment Policy
85.41

HM

E-Health Score
37.77

Health System Resources
14.80

Healthcare COVID Response
15.50

Population Vulnerability
73.58

Public Health
65.23

VR

Affordability of COVID-19 Vaccines
80.72

Deployment of COVID-19 Vaccines
61.99

Efficiency of Vaccine Allocation
61.31

Vaccine Production Capacity
30.90

CC

Acceptance of Hierarchy
45.92

Degree of Social Interdependence
56.85

Risk Objection and Uncertainty Avoidance
62.23

Importance of Personal Freedom
69.71

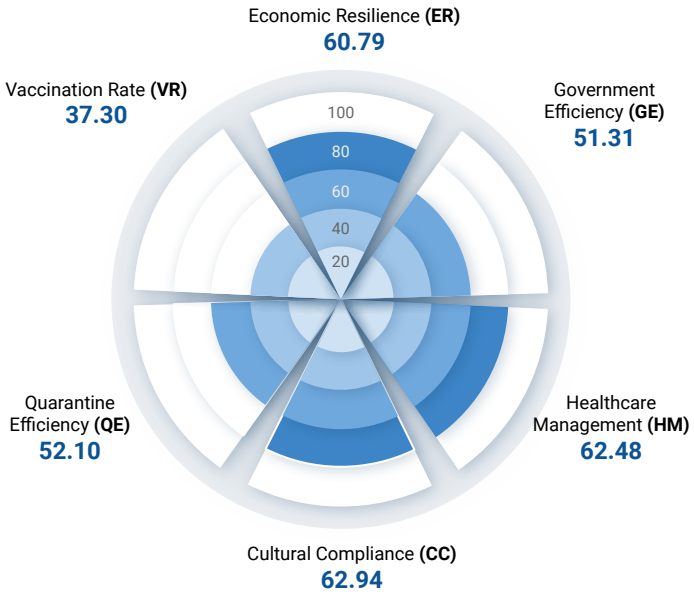
Level of Prosperity and Life Opportunities
54.85

Strength of Social Norms
54.02

◇ Average score

Pandemic-Resilient Cities Ranking – Tallinn

48/50



Overall Score – **54.49**/100

Tallinn, Estonia takes 48th place among the Top 50. The city's vaccination score is low because of absent national vaccination strategy, only 64% of the population is fully vaccinated till May 2022. A developed ICT and e-government infrastructure paired with a small population size have been helpful to shape a more cohesive community approach, however as a small country, Estonia was also more exposed to a recent, highly transmissible variant of omicron. The country's recent covid preparedness plan for the upcoming season will still aim to keep society as open as possible with vaccination remaining voluntary.

GE

- Surveillance Practices: 32.42
- Public Involvement: 62.46
- Satisfaction With Government Performance: 55.57
- E-Readiness: 65.60
- Emergency Response Mechanism: 40.13

ER

- Resilient Capacity in Times of Crisis: 60.89
- Economic Resilience From Tourism Decline: 41.77
- Economy Rescue Package: 37.23
- Economy Vitality: 55.14
- Market Attractiveness: 91.83
- Wealth Indicator: 73.57

QE

- Prevention of COVID-19 Spread: 55.03
- COVID-19 Detection: 70.29
- City Preparedness for Pandemics: 41.27
- Post-COVID Strategy: 45.45
- Stringency of Containment Policy: 48.79

HM

- E-Health Score: 95.73
- Health System Resources: 31.16
- Healthcare COVID Response: 78.93
- Population Vulnerability: 56.16
- Public Health: 66.80

VR

- Affordability of COVID-19 Vaccines: 39.03
- Deployment of COVID-19 Vaccines: 47.81
- Efficiency of Vaccine Allocation: 44.08
- Vaccine Production Capacity: 0

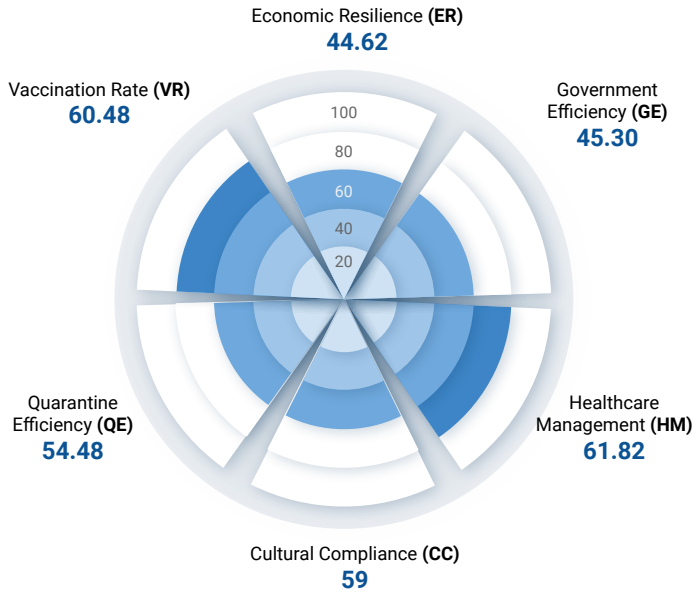
CC

- Acceptance of Hierarchy: 31.48
- Degree of Social Interdependence: 43.70
- Risk Objection and Uncertainty Avoidance: 61.68
- Importance of Personal Freedom: 89.63
- Level of Prosperity and Life Opportunities: 78.70
- Strength of Social Norms: 75.16

◇ Average score

Pandemic-Resilient Cities Ranking – Hanoi

49/50



Overall Score – **54.28**/100

Hanoi takes 49th place in the ranking. Healthcare expenditure per capita was more than 10 times below the average of the 100 countries that were analysed. There is a large shortage of hospital beds, and the health system lacked overall preparedness for a pandemic. It took 69 days for the country to respond to the pandemic, which is well above the average. By November 2021, only 22% of the population was fully vaccinated. In general, low social welfare and high inequality are key factors to consider as people are quite vulnerable to long-term shocks such as COVID-19, especially given the government's weak support policies.

GE

Surveillance Practices
57.70
Public Involvement
74.43
Satisfaction With Government Performance
49.92
E-Readiness
43.69
Emergency Response Mechanism
13.82

ER

Resilient Capacity in Times of Crisis
36.82
Economic Resilience From Tourism Decline
31.32
Economy Rescue Package
3.09
Economy Vitality
34.42
Market Attractiveness
92.27
Wealth Indicator
70.13

QE

Prevention of COVID-19 Spread
31.67
COVID-19 Detection
66.09
City Preparedness for Pandemics
90.70
Post-COVID Strategy
39.53
Stringency of Containment Policy
61.33

HM

E-Health Score
55.71
Health System Resources
11.80
Healthcare COVID Response
74.37
Population Vulnerability
83.59
Public Health
82.71

VR

Affordability of COVID-19 Vaccines
100
Deployment of COVID-19 Vaccines
65.50
Efficiency of Vaccine Allocation
48.70
Vaccine Production Capacity
20.74

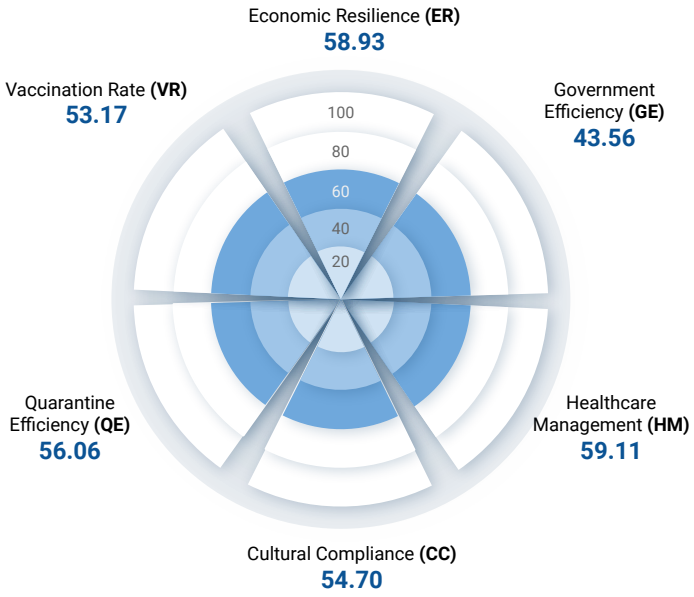
CC

Acceptance of Hierarchy
88.27
Degree of Social Interdependence
73.33
Risk Objection and Uncertainty Avoidance
39.29
Importance of Personal Freedom
35.34
Level of Prosperity and Life Opportunities
60.49
Strength of Social Norms
60.15

◇ Average score

Pandemic-Resilient Cities Ranking – Vilnius

50/50



Overall Score – **54.25**/100

Vilnius, Lithuania rounds off the top 50 cities in the ranking. The citizens have fairly low levels of trust in the government and media – almost 58% of the population do not trust the country's political parties. Regarding economic resilience, while Lithuania's government spending has increased considerably over the past 2 years, it remains below the OECD average. Further,the city lacks the capacity to produce local vaccines and is dependent on other states for vaccine supply. From a cultural dimension, the nation tends to favour liberty over authoritarianism, which is why stringent anti-COVID restrictions have often provoked opposition.

GE

- Surveillance Practices: 44.20
- Public Involvement: 26.40
- Satisfaction With Government Performance: 46.81
- E-Readiness: 59.59
- Emergency Response Mechanism: 32.55

ER

- Resilient Capacity in Times of Crisis: 52.94
- Economic Resilience From Tourism Decline: 42.75
- Economy Rescue Package: 38.47
- Economy Vitality: 47.97
- Market Attractiveness: 96.30
- Wealth Indicator: 71.89

QE

- Prevention of COVID-19 Spread: 65.90
- COVID-19 Detection: 70.32
- City Preparedness for Pandemics: 46.21
- Post-COVID Strategy: 59.73
- Stringency of Containment Policy: 37.35

HM

- E-Health Score: 95.07
- Health System Resources: 36.62
- Healthcare COVID Response: 67.57
- Population Vulnerability: 49.34
- Public Health: 63.41

VR

- Affordability of COVID-19 Vaccines: 80.72
- Deployment of COVID-19 Vaccines: 50.09
- Efficiency of Vaccine Allocation: 55.16
- Vaccine Production Capacity: 18.18

CC

- Acceptance of Hierarchy: 13.30
- Degree of Social Interdependence: 48.64
- Risk Objection and Uncertainty Avoidance: 63.31
- Importance of Personal Freedom: 85.49
- Level of Prosperity and Life Opportunities: 68.47
- Strength of Social Norms: 54.39

◇ Average score

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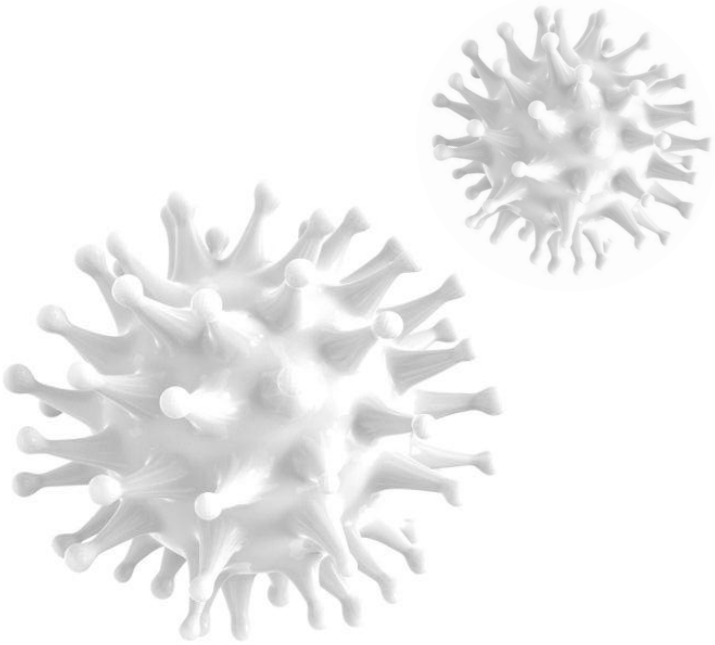

Pandemic-Resilient Cities Ranking 2022: Benchmarking of Municipal Pandemic Response - Vaccines, Economy, Prevention, Governance, Safety, Compliance

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