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COVID-19 and transport: Findings from a world-wide expert survey

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ABSTRACT

Impacts of coronavirus disease 2019 (COVID-19) on the transport sector and the corresponding policy measures are becoming widely investigated. Considering the various uncertainties and unknowns about this virus and its impacts (especially long-term impacts), it is critical to understand opinions and suggestions from experts within the transport sector and related planning fields. To date, however, there is no study that fills this gap in a comprehensive way. This paper is an executive summary of the findings of the WCTRS COVID-19 Taskforce expert survey conducted worldwide between the end of April and late May 2020, obtaining 284 valid answers. The experts include those in the field of transport and other relevant disciplines, keeping good balances between geographic regions, types of workplaces, and working durations. Based on extensive analyses of the survey results, this paper first reveals the realities of lockdowns, restrictions of out-of-home activities and other physical distancing requirements, as well as modal shifts. Experts’ agreements and disagreements to the structural questions about changes in lifestyles and society are then discussed. Analysis results revealed that our human society was not well prepared for the current pandemic, reaffirming the importance of risk communication. Geographical differences of modal shifts are further identified, especially related to active transport and car dependence. Improved sustainability and resilience are expected in the future but should be supported by effective behavioral intervention measures. Finally, policy implications of the findings are discussed, together with important future research issues.

1. Introduction

The number of confirmed cases and deaths caused by the coronavirus disease 2019 (COVID-19) are still growing rapidly across the globe. As of November 29, 2020 (https://coronavirus.jhu.edu/map.html), the total confirmed infection cases stood at 62,216,767 and total deaths at 1,451,131. The USA has suffered the most deaths so far, arguably due to a lack of national leadership. Within the 25 countries with more than 10,000 deaths, about a half are developing countries, including Brazil, Mexico, India, Iran, and Argentina. The COVID-19 pandemic has moved to a new stage. The virus will remain in the population and will resurge when given the opportunity until a vaccine is found (Euronews, 2020). COVID-19 has significantly affected the global society in various ways. The Economist Intelligence Unit (2020) predicts that the global economy will contract by 2.5%. The United Nations states that the COVID-19 pandemic affects low-income people, older persons, persons with disabilities, youth, and indigenous peoples (United Nations, 2020). On the other hand, because of lockdowns, restrictions on out-of-home activities, and other physical distancing requirements, many cities have seen air pollution drop, bringing back blue skies and cleaner air. Even though such environmental improvements may be “unfortunately (only) short-term good news” (Worrall, 2020), this is the first time in human history that we can empirically prove at the global level that behavioral changes in different life domains can contribute to improvements in environmental sustainability, even if these changes are not voluntary. To address various negative impacts and to encourage people to maintain a more sustainable lifestyle, both short-term measures and long-term strategies are required for all countries across the planet.

Similar public health crises have repeatedly occurred in human history, including the 1918 Spanish Flu. Recent examples include the Ebola outbreak in 2019, the Ebola haemorrhagic fever in 2014, the H1N1 influenza virus in 2009, the 2005–2016 Zika fever, and SARS in 2003. Unfortunately, it seems that human society has not learned much from the past as evidenced by lack of physical distancing and repeated
underestimation of the potential danger presented by COVID-19. Impacts of COVID-19 on the transport and logistics sector and their corresponding measures have been widely investigated for a range of modes (e.g., aviation (IATA, 2020; ICAO, 2020), maritime (McCauley et al., 2020; Teoh, 2020), railways (Citroën, 2020; Das, 2020), and urban transport (EIT, 2020)). Considering the existence of various uncertainties and unknowns about this virus, particularly about its impacts, it is necessary and important to understand the opinions and suggestions of experts in the transport and logistics sector. However, there is no study to date which does this in a comprehensive manner.

Our study makes an initial attempt to implement a world-wide questionnaire survey of experts in the field of transport and other relevant research fields. The survey was implemented online from April 30 to May 24, 2020 by the WCTRS COVID-19 Taskforce. As of May 24, 2020, when the survey ended, the total infection cases stood at 5,335,868 and total deaths at 341,549: only within 10 days, more than 1.0 million new infections were confirmed and deaths increased by about 50,000 persons. The survey aims to investigate the following contents related to the transport and logistics sector: [1] impacts: to investigate the impacts of COVID-19; [2] preparedness: how our society had prepared for such a pandemic; [3] during-pandemic measures: what measures are being taken by our society to fight against this pandemic; [4] recovery measures: post-pandemic; [5] long-term strategies: to explore how to generalize findings from the above actions to tackle other public health threats.

First, existing studies using expert surveys in the context of transport policy are briefly reviewed. Second, survey design and contents are described. Third, illustration of data collection and profiles of experts participating in the survey is provided. Fourth, countries’ preparedness before the COVID-19 pandemic, as reported by experts, is revealed, and measures during the pandemic, together with modal shifts observed by experts, are analyzed. Furthermore, experts’ opinions from the structured questionnaire about long-term changes in people’s lifestyles and society are given. Finally, findings are summarized and policy implications are discussed, together with important future research issues.

2. Existing studies

Expert opinions are useful to understand difficult issues, where limited knowledge is available. This can take many forms including a “Delphi process” where experts rank key factors in accordance with established criteria (Brown 1968). Searching the keywords “expert survey” and “transport policy” led to 45 hits from sciencedirect.com and 37 hits from the Web of Science. There are some overlapping papers from these two major reference sources and some papers are not related to transport. Excluding those overlapping and irrelevant papers, we found 40 papers, as shown in Table 1.

Before 2010, there were four papers about tax and green transport, scenario building for sustainable transport, transport and climate change, and hydrogen-powered transport. In these studies, 9 to 49 experts were interviewed. Between 2010 and 2015, eight studies were found, where 11–75 experts were investigated. Topics during this period covered electric vehicles, policymaking methods, intelligent traffic safety measures, sustainable transport, climate change, school bus, shift from private to public transport, and land use and transport planning. From 2016 to 2020, transport studies using expert surveys increased to 28 papers, including topics of sustainable mobility, freight transport and green logistics, autonomous and electric mobility, smart transport, 3D printing, energy and CO2 emissions, mobility for disabled people, school bus, public transport, rail transport, intermodality, and travel behavior, etc. The number of papers in the 2016–2020 period is more than three times higher than the 2010–2015 period. Thus, expert surveys have become more and more popular in transport policy studies. In the recent five years, sample sizes also increased: in 11 studies, more than 100 experts were interviewed, where the biggest sample size is 247 experts (Ralph and Delbosc, 2017), even though there are 4 studies using less than 10 experts.

Since the submission of the original manuscript at the end of July, an ever-increasing number of studies on COVID-19 in the transportation field in various countries have been observed. However, worldwide comparison studies on policy measures during the pandemic and long-term impacts are still missing. No study based on such a relatively large-scale expert survey can be found. Other major differences from recent studies will be discussed in the subsequent sections below.

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Table 1

| Authors | Year | Sample size: number of experts |
|---------|------|-------------------------------|
| Akin & Kara (2020) | 2020 | 107 |
| Goletz et al. (2020) | 2020 | 67 for Round 1, 41 for Round 2 |
| Kattiriri & Winskel (2020) | 2020 | 127 for Round 1, 69 for Round 2 |
| Kester et al. (2020) | 2020 | 227 |
| Krause et al. (2020) | 2020 | 15 names were disclosed |
| Nogues et al. (2020) | 2020 | 55 |
| Melander et al. (2019) | 2019 | 40 for Round 1, 27 for Round 2 |
| Noel et al. (2019) | 2019 | 227 |
| Salmon et al. (2019) | 2019 | 6 |
| Ulening et al. (2018) | 2018 | 15 |
| Charanwanitwong & Fraszczyl (2018) | 2018 | 18 |
| Darcy & Burke (2018) | 2018 | 15 |
| Hirschhorn et al. (2018) | 2018 | 54 |
| Jitapirom et al. (2018) | 2018 | 4 |
| Kester et al. (2018) | 2018 | 227 |
| Sovacool et al. (2018a) | 2018a | 227 |
| Sovacool et al. (2018b) | 2018b | 227 |
| Sureyyatanapas et al. (2018) | 2018 | 113 |
| Valero-Gil et al. (2018) | 2018 | 216 |
| Alsabbagh et al. (2017) | 2017 | 40 |

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1. https://www.wctrs-society.com/about-wctrs/wctrs-covid-19-task-force/ [Accessed on July 31, 2020].
3. Survey contents

The expert survey was designed to solicit views about the impacts of COVID-19 on the transport and logistics sector, how countries of the world prepared for the occurrence of such public health threats (or pandemics), what kinds of measures were taken during the COVID-19 pandemic, how people’s lives and our society were expected to change, how to make an effective recovery after the pandemic, and how to address the aforementioned changes in the future. Therefore, the aim was to ask the opinions and awareness of experts on the impacts of the pandemic on transport and logistics sector. Experts report their impressions of the impacts, and where they think careful investigation is required. This is an attempt to gain information to inform a globally relevant research and policy-making agenda. Experts were asked to report on activities which were being prohibited, restricted, and recommended within their own residence countries. Experts’ opinions about the ongoing pandemic, future changes in life and the society, and the corresponding measures are captured by pre-specified questionnaire items. The survey instrument was developed based on intensive discussions by several core members of the WCTRS COVID-19 Task Force. A key value in the resulting information is in the contrasting responses by experts in their unique cultural contexts.

Main survey contents are shown as follows (details refer to Appendix A).

1. Preparedness: the existence of guidelines and/or contingency plans for different transport modes/facilities
2. During-pandemic measures: Associated with the impacts
   - Lockdown and its timings (start and end dates) of residence city/town and in the case of lockdown, the type of restrictions being put on mobilities.
   - Declaration of a state of emergency and its timings: both residence country and city/town
   - Activities/facilities prohibited to perform/use under the current COVID-19 pandemic in residence city/town
   - Measures taken in residence city/town against COVID-19
   - Recommendations to the public in your city/town against COVID-19
3. Significant modal shifts in residence city/town during the pandemic
4. Expected long-term changes in people’s lifestyles and the society in residence country, caused by the influence of COVID-19

Similar expert surveys with such rich contents cannot be found in literature. But more and more discussions related to the above contents have been made in part among experts via various online meetings.

4. Data collection and profiles of experts

The survey webpage was distributed to members of WCTRS and its collaborative networks. The WCTRS (World Conference on Transport Research Society) is a platform for the exchange of ideas among transport researchers, managers, policy makers, and educators globally. WCTRS is multi-modal, multi-disciplinary, and multi-sectoral. Its members come from more than 60 countries and areas. WCTRS has various collaborations with other academic associations, international and domestic organizations/associations across the world. As a result, we collected questionnaires from 357 experts, of whom 284 provided valid answers (79.6%). This study presents the first survey with such a large number of experts. This sample size of experts is also the largest among existing studies using expert surveys, as reviewed in Section 2.

It should be noted that with the exception of their place of residence, experts were allowed to select multiple choices for other attributes. The place of residence of the experts were China (21.5%), Europe (17.6%), Northern America (13.4%), Japan (10.9%), India (9.9%), South Korea (6.3%), other Asian countries (11.6%), Middle East (2.5%), Africa (2.5%), and Latin America (2.1%), and Oceania (1.8%). As reviewed in Section 2, expert surveys covering such a wide range of geographical regions are rare. As for types of workplaces, experts from universities and colleges account for 69.7%, followed by experts from research institutes and think tanks (19.0%) and firms (14.4%), governments (11.6%), and NGO/NPO, and international organizations, and others (7.4%). Regarding professional experience, 38.0% of experts have worked for more than 20 years, which is the highest, followed by 15–20 years (16.2%), 10–15 years (13.4%), 5–10 years (15.8%), and less than 5 years (16.5%). Concerning research and/or professional fields, the top five are transport planning and policy (56.0%), passenger transport (44.4%), urban and regional planning (31.7%), traffic management, operation and safety (30.3%) as well as transport and land use (30.3%). Other fields include transport, climate change and environment (21.5%), transport in developing and emerging countries (19.7%), transport economics and finance (18.3%), freight transport and logistics (16.9%), transport infrastructure design and maintenance (9.9%), tourism (9.2%), energy policy (5.3%), and public health (3.2%). The survey was distributed mainly via academic associations. Therefore, there are more experts from universities and colleges. Other attributes indicate that participating experts have diverse professional backgrounds.

5. Preparedness

Preparedness is one of four key steps (preparedness, mitigation, response, and recovery) of disaster and business continuity planning and defined as a continuous cycle of planning, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response (Mische and Wilkerson, 2016).

Experts reported that for all countries/regions, the percentages of cities/towns with guidelines of transport systems for public health threats prepared before the COVID-19 pandemic are 33.5% for bus systems, 27.1% for rail transit systems, 26.8% for aviation systems, 21.8% for taxi (Table 2). The percentages for other transport modes/facilities are less than 15%: 13.4% for expressways/motorways/highways, 10.9% for maritime systems for passenger transport, 9.9% for logistics facilities, 8.5% for paratransit modes, 8.1% for maritime systems, 27.1% for rail transit systems, 26.8% for aviation systems, and 21.8% for taxi (Table 2). The percentages for other transport modes/facilities are less than 15%: 13.4% for expressways/motorways/highways, 10.9% for maritime systems for passenger transport, 9.9% for logistics facilities, 8.5% for paratransit modes, 8.1% for maritime systems, 27.1% for rail transit systems, 26.8% for aviation systems, and 21.8% for taxi. Comparisons across countries/regions (Table 2) found that for both guidelines and contingency plans, China shows the highest shares of guidelines and contingency plans for all transport modes and facilities, followed by South Korea. Each of these two countries’ shares is much higher than other countries/regions. They are followed by India and other Asian countries, meaning that they are higher even than Europe and USA/Canada (mainly USA). What do these shares mean? During the COVID-19 pandemic, to date, Europe and USA have suffered more seriously than other countries/regions. Do the higher numbers of infected cases and deaths coincide with these lower preparation ratios of guidelines and contingency plans or are there any inherent causalities? This is worth exploring in detail.

When the transport and logistics services are interrupted by a public

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2 Several examples of expert discussions can be found in webinar series organized by OECD (https://www.itf-oecd.org/sustainable-transport-and-covid-19-response-and-recovery-webinar), UN (https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=3297&menu=1634), WRI (https://www.wri.org/events/2020/04/webinar-build-back-better-public-tra nsport-and-covid-19), UTP (https://www.uitp.org/projects/uitpamz-covid-19-webinar-series/), ADB (https://www.adb.org/webinar/webinar-recordings), and UNESCAP (https://www.unescap.org/events/virtual-regional-workshop-urban-mobility-and-impacts-covid-19-mobility) (Accessed on Dec 3, 2020).
Table 2
Existence of guidelines and contingency plans against public health threats.

| Transport systems | Regions | Do not know or not sure | Bus system | No guidelines for the above systems | Rail transit system (e.g., railway, subway, street car) | Aviation system | Taxis | Expressway, motorway, highway | Maritime system: Passenger | Logistics facilities | Paratransit mode: auto rickshaw, Jeepney, tuk, etc. | Maritime system: Freight | River/canal transport system |
|-------------------|---------|------------------------|------------|-------------------------------------|---------------------------------------------|----------------|-------|-----------------------------|--------------------------|----------------|---------------------------------------------|------------------|------------------|
| Guidelines (Multiple choices) |         |                        |            |                                     |                                              |                |       |                             |                          |                |                                             |                  |                  |
| China (61)        | 26.2%   | 65.6%                  | 13.1%      | 59.0%                               | 44.3%                                        | 45.9%          | 31.1% | 21.3%                       | 16.4%                     | 11.5%           | 16.4%                                        | 14.8%            |                  |
| Europe (50)       | 44.0%   | 20.0%                  | 40.0%      | 16.0%                               | 10.0%                                        | 12.0%          | 4.0%  | 4.0%                        | 6.0%                     | 4.0%             | 2.0%                                         | 4.0%             |                  |
| USA/Canada (38)   | 52.6%   | 18.4%                  | 36.8%      | 5.3%                                | 7.9%                                         | 2.6%           | 2.6%  | 2.6%                        | 2.6%                     | 0.0%             | 0.0%                                         | 2.6%             |                  |
| Other Asia (33)   | 24.2%   | 39.4%                  | 30.3%      | 30.3%                               | 42.4%                                        | 21.2%          | 15.2% | 21.2%                       | 12.1%                     | 15.2%           | 21.2%                                        | 12.1%            |                  |
| Japan (31)        | 51.6%   | 9.7%                   | 29.0%      | 12.9%                               | 12.9%                                        | 3.2%           | 3.2%  | 0.0%                        | 0.0%                     | 0.0%             | 0.0%                                         | 3.2%             |                  |
| India (28)        | 25.0%   | 28.6%                  | 42.9%      | 25.0%                               | 32.1%                                        | 28.6%          | 21.4% | 7.1%                        | 21.4%                     | 25.0%           | 7.1%                                         | 3.6%             |                  |
| South Korea (18)  | 11.1%   | 50.0%                  | 22.2%      | 44.4%                               | 44.4%                                        | 33.3%          | 11.1% | 16.7%                       | 5.6%                     | 11.1%           | 11.1%                                        | 5.6%             |                  |
| Others (25)       | 16.0%   | 20.0%                  | 56.0%      | 8.0%                                | 24.0%                                        | 20.0%          | 8.0%  | 8.0%                        | 12.0%                     | 0.0%             | 4.0%                                         | 0.0%             |                  |
| All countries/regions | 33.8%   | 33.5%                  | 32.4%      | 27.1%                               | 26.8%                                        | 21.8%          | 13.4% | 10.9%                       | 9.9%                      | 8.5%             | 8.1%                                         | 6.7%             |                  |
| Contingency plans (Multiple choices) |         |                        |            |                                     |                                              |                |       |                             |                          |                |                                             |                  |                  |
| China (61)        | 36.1%   | 49.2%                  | 14.8%      | 45.9%                               | 26.2%                                        | 31.1%          | 18.0% | 14.8%                       | 13.1%                     | 9.8%             | 11.5%                                        |                   |                  |
| Europe (50)       | 64.0%   | 8.0%                   | 24.0%      | 10.0%                               | 8.0%                                         | 4.0%           | 0.0%  | 4.0%                        | 4.0%                     | 0.0%             | 2.0%                                         | 2.0%             |                  |
| USA/Canada (38)   | 63.2%   | 13.2%                  | 31.6%      | 7.9%                                | 5.3%                                         | 2.6%           | 0.0%  | 2.6%                        | 0.0%                     | 2.6%             | 0.0%                                         | 0.0%             |                  |
| Other Asia (33)   | 33.3%   | 21.2%                  | 42.4%      | 12.1%                               | 18.2%                                        | 9.1%           | 18.2% | 9.1%                        | 15.2%                     | 6.1%             | 12.1%                                        | 0.0%             |                  |
| Japan (31)        | 61.3%   | 9.7%                   | 25.8%      | 12.9%                               | 12.9%                                        | 3.2%           | 3.2%  | 3.2%                        | 0.0%                     | 0.0%             | 3.2%                                         | 3.2%             |                  |
| India (28)        | 25.0%   | 10.7%                  | 50.0%      | 3.6%                                | 3.6%                                         | 10.7%          | 14.3% | 0.0%                        | 17.9%                     | 10.7%            | 0.0%                                         | 0.0%             |                  |
| South Korea (18)  | 22.2%   | 22.2%                  | 33.3%      | 33.3%                               | 38.9%                                        | 5.6%           | 5.6%  | 16.7%                       | 5.6%                     | 0.0%             | 5.6%                                         | 0.0%             |                  |
| Others (25)       | 32.0%   | 16.0%                  | 52.0%      | 4.0%                                | 12.0%                                        | 8.0%           | 4.0%  | 12.0%                       | 0.0%                     | 0.0%             | 0.0%                                         | 4.0%             |                  |
| All countries/regions | 44.7%   | 21.1%                  | 31.3%      | 18.3%                               | 14.8%                                        | 11.3%          | 8.5%  | 7.7%                        | 8.5%                      | 4.2%             | 4.9%                                         | 3.5%             |                  |

(Note: The percentages do not reflect the availability of transport systems).
health pandemic, the daily life activities of millions of individuals are affected. Therefore, contingency planning in response to such disruptions is required. However, as shown in Table 2, for all countries/regions, 31.3% of experts reported that no contingency plans existed in their residence cities. The percentages of cities/towns with such contingency plans were 21.1% for bus systems, 18.3% for rail transit systems, 14.8% for aviation systems, 11.3% for taxi, 8.5% for expressways/motorways/highways, 8.5% for logistics facilities, 7.7% for maritime systems for passenger transport, 4.9% for maritime systems for freight transport, 4.2% for paratransit modes, and 3.5% for river/canal transport systems. Similar variations across countries/regions to those of guidelines are also observed.

In summary, there are more guidelines than contingency plans, with notable differences across countries/regions. Surprisingly, developing countries were reported to have more than developed countries. However, even taking the availability of transport systems into account, the existence of guidelines and contingency plans for public health threats are still very low. Policymakers should take such low percentages seriously and examine why there was a lack of preparations, considering that several pandemics had already occurred in the past. For the current COVID-19 pandemic, when some countries are suffering from many damages (losing many valuable lives and observing rapid increases in cases), why are other countries just waiting and watching, like watching a fire on the opposite bank of a river? This is an era of globalization: airlines can transport infected passengers from one side of the world to the other, within half a day. Even with no guidelines or contingency plans, the developed countries could have been more prepared given current advanced technologies. Politicians should spend more time learning lessons from the past and from each other, and urge and assist policymakers in different sectors to take more effective measures. The current crisis has shown that time is invaluable for saving lives.

However, even with guidelines and contingency plans, they may not work as expected, without proper training in advance. Pullium et al. (2014) emphasize the importance of scenario-based training for disaster learning by accounting for personalities. To mitigate the impacts of the spread of very high (66.2%, in total). Some participating experts commented on and 61.5% at the city/town level. Thus, the reported lockdown share is state of emergency, 56.1% reported a declaration at the country level (2014) implement a roadside observer survey with March 2020 and revealed that in the majority of all these stations, hand washing and social distancing were not enforced at all. Again in Ghana, Dzisi and Dei (2020) made a 1-h audit of 45 public transport stations in the Greater Accra region, Ghana at the end of March 2020 and revealed that in the majority of all these stations, hand washing and social distancing were not enforced at all. In the following two exceptions. Bonful et al. (2020) made a 1-h audit of 45 public transport stations in the Greater Accra region, Ghana at the end of March 2020 and revealed that in the majority of all these stations, hand washing and social distancing were not enforced at all. Again in Ghana, Dzisi and Dei (2020) implemented a roadside observer survey with respect to a major road in Kumasi, which is among the largest metropolitan areas in Ghana, on May 5–8, 2020, and found that 98.0% of the most popular paratransit (trotro) buses complied well with the in-vehicle physical distancing guidelines prepared by the Ministry of Transport; however, compliance with the wearing-mask guideline was only 12.6%.

### 6. Measures taken during the COVID-19 pandemic

It was found that 48.6% of experts reported an ongoing lockdown in their residence cities/towns. 17.6% reported a terminated lockdown, and the remaining answered no lockdown. As for the declaration of a state of emergency, 56.1% reported a declaration at the country level and 61.5% at the city/town level. Thus, the reported lockdown share is very high (66.2%, in total). Some participating experts commented on the issue of how to define lockdown. According to Buchholz (2020), by the late April, a third of the world population was under some form of lockdown, where lockdown was defined as a situation whereby “governments ordered their citizens to stay at home and only take a minimum of necessary trips outside, while announcing police enforcements and/or fines for people failing to meet the requirements”. Because different experts may not have the same understanding about lockdown, we did not provide any definition. Instead, we asked experts to report on the following two sets of questions, i.e., activities restricted and prohibited.

#### 6.1. Activities restricted during lockdown

As shown in Table 3, in all countries/regions, many facilities were closed: schools (64.1%), offices (46.5%), factories (44.7%), and stores (34.2%), while restrictions were put on people who could make a trip (40.1%) and on trip frequency (15.1%). In 17.6% of cities/towns, no physical exercise or walking dogs outside houses/apartments was allowed, while medical emergencies (56.3%), medical retrieval (50.7%), and shopping of daily necessities (55.3%) were allowed. As for country/region comparisons (Table 3), South Korea, Japan and China had much lower shares of restricted activities, while the shares in USA/Canada, Europe, India, other Asian countries, and other countries are extremely high. By the end of the survey period, China and South Korea had already reduced the numbers of infections and deaths dramatically. Because of this, their lower shares are understandable. However, Japan’s lower share is surprising, considering a state of emergency was in place across the whole country. Paradoxically, the USA had the highest shares of closures of offices and stores, but few limits on people who could go outside.

#### 6.2. Activities prohibited during COVID-19 pandemic

As displayed in Table 4, in all countries/regions, by the end of the survey period, major prohibited activities were cultural events (e.g., music concert, exhibition, festival) (92.8% of cities/towns), going to school (92.8%), sports events (92.3%), amusement venues (e.g., casino, bar, night club) (86.5%), libraries (84.5%), governmental services (e.g., restaurant, barbecue at park) (66.7%), offices (54.1%), factories (43.5%), and retail shops (35.3%). In 23.7% of cities/towns, physical exercise or walking dogs outside houses/apartments were prohibited. Compared with the above restricted activities, the shares of prohibitions are much higher and the country/region differences are smaller for most cases.

The above facts about activities restricted and prohibited during the pandemic indirectly reflect the impacts of COVID-19 on people’s lives and economic activities. Because of these restrictions and prohibitions, the private sector has suffered huge economic losses and many people have lost their jobs. A comparison of developed and developing countries found that developing countries had taken various strict measures against the pandemic, almost as actively as developed countries. To address these impacts and others, various measures have been taken, as described below.

#### 6.3. Protective and supportive measures

Looking at Table 5, it is found that, in all countries/regions, the top three measures are 1) stay-at-home campaigns (89.1%); 2) physical distancing-friendly goods delivery has been widely practiced (62.7%); and 3) physical distancing measures have been taken in public transport and their stations/stops (e.g., bus passengers use only rear doors to avoid close contact with the driver, bus/taill open windows during operation) (62.0%). Remarkable features from the country/region comparisons are that India uses more drones and/or robots to inform people to keep physical distances and wear masks, and other Asian countries (excluding China, Japan, South Korea and India) use more military forces for transporting/delivering emergency goods and medical services, and take protective measures by tracing people’s behavioral trajectories via high tech. The shares of physical distancing measures are higher in USA/Canada and Europe, which have the highest shares of economic stimulus measures taken for recovery of industries. The use of high-tech measures
against COVID-19 is not popular in USA/Canada and Europe. The above measures are followed by the following economic measures: “monetary compensation was paid to citizens for income reduction, medical treatment, etc.” (56.0%), “economic stimulus measures have been taken for recovery of industries” (54.6%), and “monetary compensations have been paid to transport and logistics firms suffering from economic losses” (27.8%). Such economic measures are reported in developed countries more than in developing countries. This finding is understandable; however, more social issues (e.g., the marginalization of poor and older people during the pandemic (D’cruz and Banerjee, 2020), deaths caused by the value placed on the lives of different social groups (Tisdell, 2020)) due to a lack of sufficient economic measures by governments may be expected in developing countries.

Finally, 46.5% of experts reported that protection measures for physical distancing are being taken based on information collected by tracing behavior trajectories via mobile phone, security video camera, credit card and/or other high-tech media, especially in developing countries, while 13.4% reported that drones and/or robots are being used to inform people to keep physical distances and wear masks, etc. Military forces were dispatched to take care of emergency medical services prohibited during lockdown. For instance in USA/Canada, 100% of experts reported that drone-based medical delivery services were allowed.

6.4. Recommended activities during COVID-19 pandemic

As seen from Table 6, in all countries/regions (the last row in Table 6), the most recommended activities during COVID-19 pandemic are online meetings (in 94.0% of cities/towns), avoiding gatherings (90.5%), telework or online work (88.7%), online lectures (88.4%), and avoiding eating out (76.4%).

Importantly, in 54.6% of cities/towns, it is recommended to restrict passengers on public transport (e.g., train, subway, bus), and in 22.2% of cities/towns, it is recommended to make an online booking before using a public transport mode (e.g., train, subway, bus). These measures are useful for keeping physical distance when using public transport, and it is therefore important to deploy such measures in more cities.

Looking at differences across countries/regions (Table 6), “other countries” (excluding USA/Canada, Europe, China, Japan, South Korea, India, and other Asian countries) have the largest share of restricting the number of passengers allowed to board public transport vehicles, followed by Europe. Considering its effectiveness as a physical distancing measure, transport demand control should be promoted; however in some countries it is not popular, such as in Japan which was still facing an increasing number of infections and deaths. One more feature is that the share recommending physical exercise alone or with few people is the highest in Europe.

6.5. Modal shifts: subjective observations by experts

It is observed from Table 7 that as expected, in all countries/regions, a large share of modal shift from public transport to other modes was observed based on experts’ subjective observations: the largest shift to car (64.8%), followed by walking (42.3%), cycling (35.6%), and motorcycle (19.7%).

| Table 3 | Activities restricted during lockdown. |
|---------|---------------------------------------|
| Type of activities (Multiple choices) | closure of schools | medical emergencies allowed | shopping of daily necessities allowed | medicine retrieval allowed | closure of offices | closure of factories | limit on people who can go outside | closure of stores | no physical exercise or walking dogs outside house/apartment | limit on trip frequency | others |
| Regions | | | | | | | | | | | | |
| China (61) | 36.1% | 16.4% | 23.0% | 13.1% | 23.0% | 21.3% | 27.9% | 9.8% | 9.8% | 0.0% | 0.0% |
| Europe (50) | 84.0% | 80.0% | 80.0% | 74.0% | 58.0% | 58.0% | 54.0% | 66.0% | 8.0% | 0.0% | 16.0% |
| USA/Canada (38) | 92.1% | 78.9% | 86.8% | 76.3% | 84.2% | 60.5% | 28.9% | 78.9% | 0.0% | 0.0% | 13.2% |
| Other Asia (33) | 90.9% | 84.8% | 66.7% | 69.7% | 81.8% | 72.7% | 84.8% | 72.7% | 48.5% | 0.0% | 12.1% |
| Japan (31) | 12.9% | 12.9% | 12.9% | 12.9% | 9.7% | 0.0% | 3.2% | 9.7% | 0.0% | 0.0% | 3.2% |
| India (28) | 92.9% | 92.9% | 85.7% | 78.6% | 85.7% | 89.3% | 67.9% | 60.7% | 64.3% | 7.1% | 7.1% |
| South Korea (18) | 5.6% | 5.6% | 5.6% | 5.6% | 0.0% | 0.0% | 0.0% | 0.0% | 5.6% | 0.0% | 0.0% |
| Others (25) | 88.0% | 84.0% | 76.0% | 80.0% | 68.0% | 52.0% | 68.0% | 52.0% | 20.0% | 4.0% | 24.0% |
| All countries/regions | 64.1% | 56.3% | 55.3% | 50.7% | 46.5% | 44.7% | 40.1% | 34.2% | 17.6% | 15.1% | 9.5% |

(note: the number in parenthesis after each region name refers to the number of participating experts).

| Table 4 | Activities prohibited during COVID-19 pandemic. |
|---------|---------------------------------------------|
| Type of facilities (Multiple choices) | cultural events | schools events | sports events | amusements | libraries | gastronomical services | offices | factories | retail shops | physical exercise or walking dogs outside house/apartment | others |
| Regions | | | | | | | | | | | | |
| China (60) | 86.7% | 85.0% | 80.0% | 75.0% | 68.3% | 46.7% | 38.3% | 40.0% | 11.7% | 21.7% | 0.0% |
| Europe (22) | 100.0% | 86.4% | 100.0% | 100.0% | 95.5% | 95.5% | 91.2% | 82.4% | 85.3% | 58.8% | 67.6% |
| USA/Canada (33) | 97.1% | 100.0% | 100.0% | 97.1% | 91.2% | 82.4% | 85.3% | 58.8% | 67.6% | 11.8% | 17.6% |
| Other Asia (32) | 93.8% | 96.9% | 96.9% | 96.9% | 90.6% | 90.6% | 81.3% | 65.6% | 62.5% | 56.3% | 12.5% |
| Japan (24) | 87.5% | 87.5% | 91.7% | 91.7% | 83.3% | 37.5% | 29.2% | 25.0% | 16.7% | 20.8% | 8.3% |
| India (8) | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 75.0% | 87.5% | 50.0% | 37.5% | 0.0% |
| South Korea (17) | 94.1% | 100.0% | 94.1% | 47.1% | 88.2% | 23.5% | 11.8% | 5.9% | 5.9% | 17.6% | 0.0% |
| Others (13) | 76.9% | 84.6% | 76.9% | 76.9% | 84.6% | 61.5% | 38.5% | 30.8% | 15.4% | 0.0% | 0.0% |
| All countries/regions | 92.8% | 92.8% | 92.3% | 86.5% | 84.5% | 66.7% | 54.1% | 43.5% | 35.3% | 23.7% | 8.7% |

(note: the number in parenthesis after each region name refers to the number of participating experts).
### Table 5
Protective and supportive measures.

| Type of measures (Multiple choices) | Regions                  | Stay-at-home campaign has been propagated across the whole city/town. | Physical distancing: friendly goods delivery has been widely practiced. | Physical distancing measures have been taken in public transport and their stations/stops (e.g., bus passengers use only rear doors to avoid close contact with the driver, bus/ rail opens windows during operation). | Monetary compensation was paid to citizens for income reduction, medical treatment, etc. | Economic stimulus measures have been taken for recovery of industries. | Protection measures for social distancing have been taken based on information collected by tracing behavior trajectories via mobile phone, security video camera, credit card and/or other high-tech media. | Monetary compensation was paid to transport and logistics firms suffering from economic losses. | Military forces were or have been dispatched to take care of emergency medical services. | Drones and/or robots have been used to inform people to keep social distances and wear masks, etc. | Military forces were or have been dispatched to transport emergency logistics materials. | Others |
|-----------------------------------|--------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Stay-at-home campaign            | China (61)               | 80.3%                                                               | 54.1%                                                                 | 63.9%                                                                                                                          | 31.1%                                                                                                                          | 49.2%                                                                                                                          | 68.9%                                                                                                                          | 21.3%                                                                                                                          | 13.1%                                                                                                                          | 16.4%                                                                                                                          | 13.1%                                                                                                                          | 3.3% |
| Physical distancing              | Europe (50)              | 88.0%                                                               | 78.0%                                                                 | 82.0%                                                                                                                          | 74.0%                                                                                                                          | 72.0%                                                                                                                          | 24.0%                                                                                                                          | 46.0%                                                                                                                          | 20.0%                                                                                                                          | 16.0%                                                                                                                          | 12.0%                                                                                                                          | 6.0% |
| Physical distancing              | USA/Canada (38)          | 84.2%                                                               | 78.9%                                                                 | 78.9%                                                                                                                          | 60.3%                                                                                                                          | 71.1%                                                                                                                          | 26.3%                                                                                                                          | 31.6%                                                                                                                          | 10.5%                                                                                                                          | 2.6%                                                                                                                          | 5.3%                                                                                                                          | 5.3% |
| Economic stimulus                | Other Asia (33)          | 97.0%                                                               | 72.7%                                                                 | 60.6%                                                                                                                          | 66.7%                                                                                                                          | 42.4%                                                                                                                          | 66.7%                                                                                                                          | 27.3%                                                                                                                          | 39.4%                                                                                                                          | 12.1%                                                                                                                          | 30.3%                                                                                                                          | 3.0% |
| Protection measures for          | Japan (31)               | 100.0%                                                              | 25.8%                                                                 | 32.3%                                                                                                                          | 45.2%                                                                                                                          | 32.3%                                                                                                                          | 19.4%                                                                                                                          | 12.9%                                                                                                                          | 6.3%                                                                                                                          | 0.0%                                                                                                                          | 3.2%                                                                                                                          | 3.2% |
| Social distancing                | South Korea (18)         | 96.4%                                                               | 67.9%                                                                 | 32.1%                                                                                                                          | 53.6%                                                                                                                          | 39.3%                                                                                                                          | 57.1%                                                                                                                          | 10.7%                                                                                                                          | 3.6%                                                                                                                          | 46.4%                                                                                                                          | 3.6%                                                                                                                          | 10.7% |
| Measures                          | Others (25)              | 96.0%                                                               | 64.0%                                                                 | 60.0%                                                                                                                          | 60.0%                                                                                                                          | 56.0%                                                                                                                          | 48.0%                                                                                                                          | 28.0%                                                                                                                          | 24.0%                                                                                                                          | 4.0%                                                                                                                          | 24.0%                                                                                                                          | 4.0% |
| Others                            | All countries/ regions   | 89.1%                                                               | 62.7%                                                                 | 62.0%                                                                                                                          | 56.0%                                                                                                                          | 56.0%                                                                                                                          | 46.5%                                                                                                                          | 27.8%                                                                                                                          | 15.8%                                                                                                                          | 13.4%                                                                                                                          | 12.0%                                                                                                                          | 5.3% |

(note: the number in parenthesis after each region name refers to the number of participating experts).
Among the 22.5% or 64 answers, 16 report a decline of all trips due to lockdown and other restrictions, 14 did not know or were not sure, 14 did not observe any of the above major shifts, and 7 said that more walking and cycling were used. Thus, while public transport should be further improved, the current crisis should be regarded as a chance to significantly increase the share of walking and cycling.

The shift from public transport to car in South Korea and China is most remarkable. In contrast, Europeans show a more environmentally sustainable and healthy travel style, i.e., shift from public transport to walking and bicycle. In India and other Asian countries, the shift from public transport to motorcycle is much higher than other countries/regions. Considering that motorcycles are already popular in developing countries, such trends induced by the pandemic should be given more attention by policy makers, as it may lead to other problems, such as more traffic accidents, together with serious pollution. India shows the most remarkable. In contrast, Europeans show a more environmentally sustainable and healthy travel style, i.e., shift from public transport to walking and bicycle. In India and other Asian countries, the shift from public transport to motorcycle is much higher than other countries/regions.

Examples include, Abdullah et al. (2020), Beck et al. (2020), Beck and Hensher (2020), Borkowski et al. (2020), Bucsky (2020), de Haas et al. (2020), De Vos (2020), Jeneliu and Cebecauer (2020), Pawar et al. (2020), Saladié et al. (2020), Shakibaei et al. (2020), Suau-Sanchez et al. (2020), and Teixeira and Lopes (2020).
Table 8
Changes in people’s lifestyles expected by experts.

(a) Average percentages for overall samples.

| Types of changes in lifestyles | Fully agree | Agree | Neutral | Disagree | Fully disagree |
|--------------------------------|-------------|-------|---------|----------|----------------|
| [1] Infection risk level of a job will determine job choices | 3.9%         | 32.0% | 30.6%   | 25.0%    | 8.5%           |
| [2] Online working (working at home, neighboring satellite offices, cafes, etc.) will become popular | 26.8%        | 51.1% | 13.4%   | 5.6%     | 3.2%           |
| [3] More and more people will choose a job allowing them to mainly work at home | 4.2%         | 29.9% | 34.9%   | 26.1%    | 4.9%           |
| [4] Working hours will become longer | 4.9%         | 21.1% | 37.0%   | 28.2%    | 8.8%           |
| [5] More and more people will out-migrate from populated cities | 2.8%         | 19.4% | 31.7%   | 31.7%    | 14.4%          |
| [6] More and more people will choose to live far from the city center | 2.5%         | 18.0% | 31.3%   | 36.3%    | 12.0%          |
| [7] Online shopping will become the most popular shopping activity | 20.4%        | 40.5% | 21.1%   | 14.8%    | 3.2%           |
| [8] Online education will be a standard model of education | 7.7%         | 26.4% | 32.7%   | 23.6%    | 9.5%           |
| [9] The society will become more isolated due to the progress of online activities and smart technologies (AI, IoT, robotics, etc.) | 10.6%        | 41.2% | 23.9%   | 20.8%    | 3.5%           |
| [10] Family bonds will be enhanced significantly | 9.5%         | 37.3% | 39.1%   | 10.9%    | 3.2%           |
| [11] The car dependence will become more obvious due to adverse reactions to crowded public transport during the COVID-19 pandemic | 12.3%        | 50.7% | 22.2%   | 10.2%    | 4.6%           |

(b) Average percentages of “fully agree” and “agree” by country/region.

| Region | Infection risk level of a job will determine job choices | Online working (working at home, neighboring satellite offices, cafes, etc.) will become popular | More and more people will choose a job allowing them to mainly work at home | Working hours will become longer | More and more people will out-migrate from populated cities | More and more people will choose to live far from the city center | Online shopping will become the most popular shopping activity | Online education will be a standard model of education | The society will become more isolated due to the progress of online activities and smart technologies (AI, IoT, robotics, etc.) | Family bonds will be enhanced significantly | The car dependence will become more obvious due to adverse reactions to crowded public transport during the COVID-19 pandemic |
|--------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|
| China (61) | 32.8%                                                  | 65.6%                                                                                          | 23.0%                                                                   | 23.0%                                          | 13.1%                                                                         | 14.8%                                                            | 67.2%                                                            | 39.3%                                                            | 42.6%                                                              | 52.5%                                                              | 60.7%                                                              |
| Europe (50) | 20.0%                                                  | 84.0%                                                                                          | 20.0%                                                                   | 16.0%                                          | 22.0%                                                                         | 10.0%                                                            | 42.0%                                                            | 24.0%                                                            | 38.0%                                                              | 28.0%                                                              | 54.0%                                                              |
| USA/Canada (38) | 34.2%                                                  | 84.2%                                                                                          | 42.1%                                                                   | 28.9%                                          | 26.3%                                                                         | 21.1%                                                            | 52.6%                                                            | 18.4%                                                            | 52.6%                                                              | 39.5%                                                              | 81.6%                                                              |
| Other Asia (33) | 48.5%                                                  | 78.8%                                                                                          | 42.4%                                                                   | 42.4%                                          | 27.3%                                                                         | 21.2%                                                            | 66.7%                                                            | 57.6%                                                            | 63.6%                                                              | 66.7%                                                              | 69.7%                                                              |
| Japan (31) | 51.6%                                                  | 83.9%                                                                                          | 35.5%                                                                   | 12.9%                                          | 22.6%                                                                         | 25.8%                                                            | 45.2%                                                            | 41.9%                                                            | 45.2%                                                              | 41.9%                                                              | 48.4%                                                              |
| India (38) | 50.0%                                                  | 89.3%                                                                                          | 50.0%                                                                   | 50.0%                                          | 25.0%                                                                         | 28.6%                                                            | 85.7%                                                            | 25.0%                                                            | 82.1%                                                              | 60.7%                                                              | 75.0%                                                              |
| South Korea (18) | 22.2%                                                  | 72.2%                                                                                          | 38.9%                                                                   | 11.1%                                          | 22.2%                                                                         | 22.2%                                                            | 83.3%                                                            | 27.8%                                                            | 61.1%                                                              | 33.3%                                                              | 61.1%                                                              |
| Others (25) | 36.0%                                                  | 68.0%                                                                                          | 44.0%                                                                   | 28.0%                                          | 28.0%                                                                         | 36.0%                                                            | 64.0%                                                            | 40.0%                                                            | 52.0%                                                              | 56.0%                                                              | 56.0%                                                              |

(note: the number in parenthesis after each region name refers to the number of participating experts).
Table 9
Changes in our society expected by experts.

(a) Average percentages for overall samples.

| Changes in society                                                                 | Fully agree | Agree | Neutral | Disagree | Fully disagree |
|-----------------------------------------------------------------------------------|-------------|-------|---------|----------|---------------|
| [1] Social and economic systems will not return to the previous ones before COVID-19. | 11.3%       | 39.8% | 22.2%   | 20.8%    | 6.0%          |
| [2] Online services of government, bank, ticket purchase, etc. Will become a standard service. | 21.8%       | 51.8% | 18.7%   | 4.9%     | 2.8%          |
| [3] Smart technologies (e.g., AI, IoT, robotics) will be the key to detect and sound the alarm on the occurrence of future public health threats | 15.5%       | 51.1% | 23.6%   | 7.0%     | 2.8%          |
| [4] More and more inter-city business trips for meetings will be replaced by online meetings. | 17.6%       | 64.1% | 9.5%    | 6.7%     | 2.1%          |
| [5] More and more intra-city business trips for meetings will be replaced by online meetings. | 13.4%       | 56.7% | 17.3%   | 10.2%    | 2.5%          |
| [6] The induced growth of online business and automation will lead to more unemployment. | 8.8%        | 38.7% | 31.3%   | 18.3%    | 2.8%          |
| [7] The cost structure of the transport and logistics sector may be altered dramatically to prepare for future public health threats. | 10.6%       | 53.2% | 23.9%   | 9.5%     | 2.8%          |
| [8] The intervention of governments to transport/logistics industries will be strengthened after COVID-19. | 7.4%        | 48.9% | 29.2%   | 11.3%    | 3.2%          |
| [9] Significant changes will occur, within five years, in transport and logistics policymaking due to lessons from COVID-19. | 12.3%       | 52.5% | 23.2%   | 8.1%     | 3.9%          |
| [10] The expected changes will contribute to improving resilience and sustainability of the transport and logistics sector. | 6.3%        | 53.2% | 25.4%   | 12.3%    | 2.8%          |

(b) Average percentages of “fully agree” and “agree” by country/region.

| Region       | Social and economic systems will not return to the previous ones before COVID-19. | Online services of government, bank, ticket purchase, etc. Will become a standard service. | Smart technologies (e.g., AI, IoT, robotics) will be the key to detect and sound the alarm on the occurrence of future public health threats | More and more inter-city business trips for meetings will be replaced by online meetings. | More and more intra-city business trips for meetings will be replaced by online meetings. | The induced growth of online business and automation will lead to more unemployment. | The cost structure of the transport and logistics sector may be altered dramatically to prepare for future public health threats. | The intervention of governments to transport/logistics industries will be strengthened after COVID-19. | Significant changes will occur, within five years, in transport and logistics policymaking due to lessons from COVID-19. | The expected changes will contribute to improving resilience and sustainability of the transport and logistics sector. |
|--------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| China (61)   | 49.2%                                                                            | 68.9%                                                                            | 70.5%                                                                            | 68.9%                                                                            | 59.0%                                                                            | 47.5%                                                                            | 62.3%                                                                            | 60.7%                                                                            | 54.1%                                                                            | 62.0%                                                                            |
| Europe (50)  | 52.0%                                                                            | 72.0%                                                                            | 54.0%                                                                            | 92.0%                                                                            | 64.0%                                                                            | 42.0%                                                                            | 56.0%                                                                            | 52.0%                                                                            | 66.0%                                                                            | 62.0%                                                                            |
| USA/Canada (38) | 57.9%                                                                            | 78.9%                                                                            | 44.7%                                                                            | 89.5%                                                                            | 81.6%                                                                            | 50.0%                                                                            | 65.8%                                                                            | 50.0%                                                                            | 73.7%                                                                            | 44.7%                                                                            |
| Other Asia (33) | 51.5%                                                                            | 78.8%                                                                            | 75.8%                                                                            | 84.8%                                                                            | 78.8%                                                                            | 54.5%                                                                            | 72.7%                                                                            | 54.5%                                                                            | 69.7%                                                                            | 75.8%                                                                            |
| Japan (31)   | 54.8%                                                                            | 80.6%                                                                            | 71.0%                                                                            | 83.9%                                                                            | 74.2%                                                                            | 35.5%                                                                            | 74.2%                                                                            | 51.6%                                                                            | 54.8%                                                                            | 58.1%                                                                            |
| India (28)   | 42.9%                                                                            | 67.9%                                                                            | 78.6%                                                                            | 78.6%                                                                            | 71.4%                                                                            | 67.9%                                                                            | 60.7%                                                                            | 75.0%                                                                            | 78.6%                                                                            | 53.6%                                                                            |
| South Korea (18) | 33.3%                                                                            | 72.2%                                                                            | 77.8%                                                                            | 72.2%                                                                            | 55.6%                                                                            | 33.3%                                                                            | 61.1%                                                                            | 55.6%                                                                            | 55.6%                                                                            | 38.9%                                                                            |
| Others (25)  | 60.0%                                                                            | 72.0%                                                                            | 76.0%                                                                            | 84.0%                                                                            | 84.0%                                                                            | 48.0%                                                                            | 60.0%                                                                            | 52.0%                                                                            | 72.0%                                                                            | 52.0%                                                                            |

(note: the number in parenthesis after each region name refers to the number of participating experts).
behavior and the spread of COVID-19. As an exception, Hadjidemetriou et al. (2020) estimated that reduced operation of subway and railway services in the UK may have contributed to a reduction of daily trips in March 2020, combined with effects from other non-transport measures such as guidance and recommendations on avoiding non-essential travel and the closure of schools. Differently, this study assesses the effects of transport-related policy measures in terms of modal shifts based on experts’ subjective observations.

7. Experts’ opinions on long-term changes

In this survey, 21 structured questions were shown to experts: 11 are about long-term changes in lifestyles, and the remaining are about long-term changes in society.

7.1. Long-term changes in lifestyles

As for changes in lifestyles (Table 8(a)), 77.8% of experts fully agreed or agreed to “online working (working at home, neighboring satellite offices, cafes, etc.) will become popular”, followed by agreement on “the car dependence will become more obvious due to adverse reactions to crowded public transport during the COVID-19 pandemic” (63.0%: fully agreed or agreed) and “online shopping will become the most popular shopping activity” (60.9%: fully agreed or agreed). Many experts argue that online working and shopping will become more dominant in people’s future lives.

Regarding car usage, 14.8% of experts disagreed or fully disagreed that car dependence would increase. Such disagreement may be reasonable, for example, if people change their activity patterns without using more cars.

Related to jobs, 35.9% of experts thought that the infection risk level of a job will determine job choices, 34.2% expected that more and more people will choose a job allowing them to mainly work at home, and 26.1% stated that working hours will become longer.

Because of fear about virus infection, we expected a significant number of people would out-migrate from populated cities and live far from city centers. This expectation is supported by about 20% of experts: out-migration from populated cities (22.2%) and living far from city centers (20.4%) were reported, respectively.

Even though many students are taking online lectures, only about 30% of experts agree that online education will be a standard model of education.

More than 50% of experts think that the society will become more isolated due to the progress of online activities and smart technologies (AI, IoT, robotics, etc.). Due to long stays at home together with family members, family bonds are expected to be significantly enhanced. This argument is supported by 46.8% of experts.

Table 8(b) shows differences across countries/regions in experts’ opinions about changes in lifestyles. Based on the shares of “fully agree” and “agree”, experts who expect that car dependence will become more obvious had the highest share in the USA, followed by India. Experts in India report that online shopping and working is expected to become more preferred, but also show the highest share who believe that society will become more isolated due to the progress of online activities and smart technologies. Online shopping is expected to become more popular in South Korea. Surprisingly, the popularity of online shopping in Europe and USA/Canada as well as Japan is evaluated by experts to be lower than in other countries/regions. Working hours is believed to become longer in India and other Asian countries. Interestingly, the top three countries with the highest agreement on the statement “infection risk level of a job will determine job choices” are Japan, India and other Asian countries (excluding China and South Korea). A serious problem which has emerged in Japan has been the refusal of hospitals and other medical facilities to admit patients with fever due to concerns over infection risks. Serious attention needs to be given to choices of medical jobs in the future.

In summary, the experts’ opinions above suggest that policymakers should make efforts to prevent increased car dependence due to adverse reactions to public transport services after the pandemic. Such a trend may be further strengthened by more people wanting to live outside of city centers in suburban and exurban settings. More out-migration from megacities will translate into increased vehicle use per capita. A primary strategy to combat this is to support investment in active transport infrastructure and walkable urban design within cities. Transfer to online activities will help to mitigate some of the increase in demand for vehicle use. Policymakers can employ a wide array of “growth management tools” to stem outmigration from cities (DeGrove 1984). There is much to be learned from historical efforts to try to combat car dependence, especially as most attempts in the past failed and were not successful.

7.2. Long-term changes in the society

In contrast to the responses on expected changes in lifestyles, there are more experts who support our assumed changes in society after the COVID-19 pandemic (see Table 9(a)). More than 60% (up to about 82%) of experts support (fully agree or agree) the following statements about changes in society.

- (81.7%) More and more inter-city business trips for meetings will be replaced by online meetings.
- (73.6%) Online services of government, bank, ticket purchase, etc. will become a standard service.
- (70.1%) More and more intra-city business trips for meetings will be replaced by online meetings.
- (66.5%) Smart technologies (e.g., AI, IoT, robotics) will be the key to detect and sound the alarm on the occurrence of future public health threats.
- (64.8%) Significant changes will occur, within 5 years, in transport and logistics policymaking due to lessons from COVID-19.
- (63.7%) The cost structure of the transport and logistics sector may be altered dramatically to prepare for future public health threats.

Related to inter-city business trips, online meetings may also come to replace intercontinental travel. More online meetings and other online activities, together with other changes in lifestyles, provide us with an unprecedented opportunity to make changes toward truly improved sustainable development.

Meanwhile, 56.3% of experts think that the intervention of governments to transport/logistics industries will be strengthened after COVID-19. As for government interventions, to address the impacts of COVID-19, private hospitals have been nationalized in Spain, various modes of transport in the UK may possibly be nationalized, and France is ready to nationalize large businesses (Mair, 2020).

Many international organizations are arguing about the coming ‘new normal’ (Albani, 2020; Pantuliano, 2020; Park, 2020; Tzannatos, 2020). Related to this, we asked experts about whether social and economic systems will return to the previous ones before COVID-19 or not. It was found that while 51.1% of experts support this argument, 48.9% either expressed their neutral opinions (22.2%) or showed a disagreement or a full disagreement.

About 60% of experts think that the expected changes will contribute

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5 https://medical.nikkeibp.co.jp/leaf/mem/pub/series/taniguchi/202004/565042.html (in Japanese) [Accessed on July 31, 2020].
6 https://books.j-cast.com/2020/04/06011253.html (in Japanese) [Accessed on July 31, 2020].
to improving the resilience and sustainability of the transport and logistics sector. Needless to say, these changes are necessary to improve resilience and sustainability, but not sufficient.

Comparisons across countries/regions (Table 9(b)) found obvious differences across countries/regions. However, the differences are not as remarkable as those of changes in lifestyles. The featured differences are summarized here. First, governmental interventions to transport and logistics industries will become most obvious in India. This is consistent with the observation that the highest share of experts in India are worried that the induced growth of online business and automation will lead to more unemployment. As for online services of government, worried that the induced growth of online business and automation will lead to more unemployment. As for online services of government, Japan shows the highest share.

Related to the above phenomenon in Japan, to avoid infections at toll gates on expressways, the central government is planning to make all gates use ETC (electronic toll collection), compared with the current usage rate of 93%.

Europe is expected to see most replacements of inter-city trips by online meetings, followed by USA/Canada; meanwhile, USA/Canada is expected to see more replacements of intra-city trips (even higher than Europe). Other Asian countries (excluding China, Japan, South Korea, and India) are expected to have more changes in all aspects related to society. Using smart technologies to detect and sound the alarm on the occurrence of future public health threats is not that welcome in USA/Canada and Europe, but it is welcome in India, South Korea and other Asian countries as well as other countries. Interestingly, Japan has a similar higher agreement on use of smart technologies as China. For the cost structure change in the transport and logistics sector, experts in Japan and other Asian countries showed higher expectations. India and USA/Canada are the top two countries that see significant changes in transport and logistics policymaking due to lessons from COVID-19. Other countries show the highest agreement on the statement “social and economic systems will not return to the previous one before COVID-19”.

The many changes observed are expected to improve resilience and sustainability of the transport and logistics sector, especially in other Asian countries and China, while South Korea and USA/Canada are the two countries with the lowest expectation in this respect.

8. Conclusions and future research issues

Recognizing the existence of various uncertainties and unknowns about COVID-19 and its impacts (especially long-term impacts), a worldwide questionnaire survey of experts in the fields of transport and other relevant disciplines was conducted between the end of April and late May 2020, when global daily new cases showed a relatively stable fluctuation pattern (85,000–100,000 cases). For experts, this period must have been a very busy time, because many were involved in education, government work, handling of business operations and so on, in response to COVID-19. Nevertheless, 357 experts participated in the survey and 284 provided valid answers. These 284 experts had a balanced profile in terms of countries of residence, professional fields, and duration of professional experience. This is the first COVID-19 study which invited a large number of experts with a balance of different professional experience, in the context of transport and logistics. Various insightful findings for policymaking against public health pandemics have been derived.

8.1. Findings

Analyses of expert survey results revealed serious impacts of COVID-19 on transport, logistics, and daily life, in terms of prohibited and restricted activities. Major findings can be summarized as follows.

1. The maximal percentage of cities/towns with guidelines and/or contingency plans in transport and logistics sector against public health threats was only about 30%, on average.
2. Nearly 70% of cities/towns where experts were living, experienced or were still experiencing lockdown.
3. Stay-at-home campaigns, physical distancing measures in public transport and goods delivery, economic measures, avoidance of face-to-face social contacts, and online activities were the predominant measures against COVID-19 in the transport sector.
4. Remarkable modal shifts away from public transport usage were reported, with shifts in trip demand to car, walking and cycling. Even though total modal shifts to active transport (walking and bicycle) were higher than the shift to car (especially in Europe), a greater than 60% shift from public transport to car (especially in South Korea and China) was reported. In India and other Asian countries, the shift from public transport to motorcycle was much higher than other countries/regions.
5. Developing countries were almost equally active in taking various strict measures against the pandemic as developed countries; however, economic measures for addressing the impacts of the pandemic in developing countries were reported to be less sufficient.
6. Concerning long-term changes in people’s lifestyles, experts showed great concern about the potentially increasing car dependence on the one hand, balanced by the expectation that there will be more shifts of activity participation from physical spaces to virtual spaces on the other.
7. In the case of long-term changes in society, there are more experts who expect changes toward improved sustainability than those showing opposite opinions.

8.2. Policy implications

Preparedness is crucial to prevent and mitigate the spread of pandemics. The reported low percentage of guidelines and contingency plans in transport and logistics sector was extremely problematic, considering that many countries had suffered seriously from the pandemic. Coincidently and expectedly, this low percentage is especially remarkable in those countries/regions with more infected cases and deaths. This finding suggests that our human society has not learned from previous lessons. This implies that the impacts of future pandemics are more likely to be underestimated. For this, effective risk communication should be made to various stakeholders, repeatedly. For serious pandemics like COVID-19, it is necessary to make guidelines and/or contingency plans in the transport sector mandatory, based on publicly-accepted institutional design.

Partially due to bad preparations (not only in the transport sector but also in other sectors), there is no sign that the current increasing trend of daily new cases at the global level will slow down. It is a great challenge to re-open economic activities while mitigating the impacts of COVID-19. How to address ethical, legal, and social issues related to lockdown and reopening of economy will be a key.

Various measures have been implemented and played a certain role in mitigating the spread of the virus and addressing the various impacts of COVID-19, even though we cannot provide any objective evidence from this study on the effects of such measures. To make a balance between economic activities and mitigating the spread of COVID-19, spatial heterogeneity should be considered. For example, it may not be necessary to lockdown the whole country or the whole region. Lockdowns limited to riskier places may be more cost-efficient and
publicly acceptable.

Measures against COVID-19 (i.e., physical distancing measures) were found to generate negative impacts on transport: i.e., significant modal shifts from public transport to car was reported by experts. This is a serious concern for sustainable transport development. Geographical differences of these subjectively-observed modal shifts reflect both the adaptive capacity of transport users to disruptions of public transport systems and the resilience of transport systems against pandemics. For example, higher shift from public transport to active transport in Europe is partially because the European transport systems and lifestyles allow trip makers to easily shift to active transport, which seems to reflect the strong policy initiatives for bicycle lanes and health campaigns by the governments. More car use in South Korea and China as well as the USA reflects the car-dependent lifestyle and lower popularity of active transport. More policy efforts in the future should be made to further promote active transport and discourage car use after the current pandemic.

The above negative impacts can be partially offset by the growth of online-dependent lifestyles, which is expected to continue after the current pandemic. Promoting online activities surely has great potential to replace trip making, as evidenced during the current pandemic. COVID-19 has forced people to re-consider their lifestyles toward both the targets of resilience and sustainability, even if changes in lifestyles may be tentative. The current pandemic has empirically revealed at the global level that behavioral changes of both individuals and private firms as well as governments do matter to sustainability and resilience. Behavioral intervention measures should be positioned at a higher level in the sustainable development policy agenda.

Reflecting the aforementioned online lifestyles, it is rational to assume that business owners will become less reluctant to make more use of online tools to reduce trips and enhance business productivity, and people will make greater use of online working to replace commuting, in order to reduce both monetary and time costs. Policy makers should regard the current pandemic (crisis) as a new opportunity to further promote sustainable development by continuously encouraging voluntary behavioral changes toward resilience against pandemics, while making effective institutional design to involve all stakeholders and make full use of various capitals.

Infections and deaths have also become more and more serious in many developing countries. How to overcome these difficult challenges in developing countries should be treated as a global governance issue under various international cooperation frameworks involving not only the transport sector, but also the public health sector as well as other social and economic sectors.

8.3. Future research issues

Even though more evidence on the impacts of COVID-19 has been accumulating, there are still many unknowns. Experts suggest that more research efforts should be made, including the improvements in the present expert survey research. Some areas for improvement were also suggested.

8.3.1. Further improvements to the present expert survey

According to the comments from participant experts, definitions of lockdown differ across countries/regions. In this sense, the term “lockdown” is not useful to capture actual situations. Because policies/measure are highly time-dependent and conditional on available budgets, it is necessary to better phrase relevant questions and to clarify tradeoffs between policies/measure. To minimize the infection risks, cross-sectoral joint efforts are required. Even for trip making, which is a derived demand from activity participation, policies/measure should be taken from both transport and activity perspectives to minimize the infection risks related to trip makers (being infected by others or infecting others). Focusing on transport, more detailed types of transport modes (including smart and shared mobility: e.g., bike sharing, car sharing, MaaS, autonomous vehicles) should be investigated. Various online activities are expected to boom in the near future. It is necessary to measure the market size of each type of online activity to estimate their mitigating effects on transport issues. Such online activities may be associated with life arrangements or lifestyles. The life-oriented approach (Zhang, Van Acker, 2017; Zhang, 2017) may be useful to capture the whole picture of changes in life in a comprehensive way by focusing on various life domains. An application is made by Zhang (2021), who investigated responses of Japanese people to the COVID-19 pandemic at its early stage and revealed co-changes in travel behaviors and life activities. Such a life-oriented perspective is important because fears about the virus keep people from not only trip making but also activity participation and other daily and non-daily life activities. If such a perspective is not taken into account, this may underestimate the impacts of COVID-19, leading to ineffective and/or inefficient policy decisions. Due to the changing situations about COVID-19 and differences across countries/regions, it is worth implementing a follow-up survey to participant experts by providing feedback on the present survey. Ozaydin and Ulengin (2020) implemented an additional expert survey in Turkey, by using the same contents of the expert survey in this study, and found various similarities and dissimilarities about the impacts of COVID-19, measures and future changes. In particular, they made several important cross-border policy recommendations which reflected Turkey’s unique geographical location. Such country-specific surveys should also be implemented in more countries in order to derive general and robust insights for policymaking against the further spread of the virus SARS-CoV-2 and preventing the occurrence of other pandemics in future. Based on the survey results, in-depth discussions among selected experts may be helpful to derive more effective policies/measures at different levels (e.g., global, national, regional, and city/town).

8.3.2. Association between transport and the spread of COVID-19

Even though the expert survey did not investigate how transport has contributed to the spread of COVID-19, the WCTRS COVID-19 Taskforce already emphasized the importance of paying more attention to the two-way associations between transport and the spread of the virus in policymaking via its messages to the global society10. However, relevant evidence has been accumulated quickly. Sokadjo and Atchade (2020) found that at the global level, passenger air traffic is positively related to the number of infections. Zhang et al. (2020a) showed that infection cases in China were strongly associated with frequencies of flights and high-speed trains, while Zhang et al. (2020b) revealed the imported case risk imposed by foreign countries on Chinese provinces and further confirmed the effectiveness of China’s strict restriction on inbound flights after March 26 in dramatically reducing the imported case risk. From a different angle, Zhang et al. (2020) and Carteni et al. (2021) observed a strong positive correlation between transport accessibility and the infection cases in Japan and Italy, respectively. Carteni et al. (2020) further clarified that mobility habits (measured by the number of people who made trips several days before) were also positively associated with the number of confirmed infection cases in Italy. Transportation networks and connections are an important part of the built environment. In this regard, Li et al. (2021) clarified the nonlinear effects of various built environment attributes (including transportation) on the city-level spread of COVID-19 at its initial stages in China. Various new findings are available; however, there is a lack of scientifically sound evidence about infection risks inside transport vehicles, which has become a huge barrier for transport policy makers to properly

10. The Task Force made a COVID-19 Appeal in April 2020. Details refer to: http://www.wctrs-society.com/about-wctrs/wctrs-covid-19-taskforce/wctrs-covid-19-appeal/.
promote the use of public transport and air transport under well-designed transport business continuity plans.

Interdisciplinary research on transport, urban planning, and public health measures.

After experiencing such a serious pandemic, people will become sensitive to public health threats in the future, though it is unclear how long such a tendency will last. To better address the impacts of public health threats in the future, and to enhance accountability of policy decisions (Weibe et al., 2020), more interdisciplinary research on transport and public health measures should be conducted.

In the urban context, current physical distancing practices require urban planners, transport planners and community designers to reconsider current designs of public spaces, spaces of public transport vehicles and platforms, and building spaces, etc., to prevent infection of viruses, and to re-plan current cities and transport systems for the coming “new normal”. For such a reorientation, decision makers and planners of cities and transport systems must work together with the public health sector. For this, new ways of thinking are required for policymaking and planning of cities and transport systems, where pandemics will have to be considered.

8.3.3. Citizen participation and risk communication

For the current pandemic, a study in Japan revealed that poor communication between governments and the public may be associated with the spread of COVID-19 at its early stages (Zhang, 2021). In general, successful interventions and effective policy measures require better citizen participation or public involvement. Various lessons could be learned from public health threats in the past; however, the current experience suggests that not all lessons are adopted. Then the questions to be asked are: should there be any differences of public involvement in response to COVID-19 and other public health threats, and why weren’t the historical lessons utilized in the fight against the current pandemic?

Research on the potential rise in car dependence and active transport after the COVID-19 pandemic.

Even though more than 60% of participating experts agreed that there is a potential for increasing car dependence after the current pandemic, such a trend will not occur on its own. It will depend on various policies after the pandemic: industrial policies, anti-car measures via pricing, pro-car measures via new technologies (e.g., autonomous vehicles), the intensity of public transport improvement measures, active transport measures, changes in lifestyles and attitudes, and so on. All these should be better addressed in the future.

Researchers also reported increases in active transport, especially in Europe. Active transport should also be promoted in other regions, not only for avoiding infection risks and making transport systems more resilient but also for sustainable transport development and healthy lifestyles. It is necessary to clarify whether the trend of active transport observed during the pandemic will continue after the pandemic or not, and how to maintain the trend.

8.3.4. Research on urban form

The impact of the current pandemic is most pronounced in large-sized cities. Even though only about 20% of experts reported potential urban sprawl and out-migration from populated cities, it is not unrealistic to examine whether the current trend of megacities will slow down or not, and within a particular country, whether the regional distribution of the population will become more balanced or not. For example, in Japan, young people’s migration is the main driver for the over-concentration of the population in the three megacity regions (Tokyo, Nagoya and Osaka). The pandemic may encourage more young people to move back to local cities. Transport policy making should pay more attention to local cities within a well-coordinated regional planning framework with industrial policymaking and other public policies, which can, for example, attract new industries to local cities.

8.3.5. Research on smart technologies

The current pandemic has resulted in the rapid diffusion of various online businesses. This trend is likely to continue. Consequently more delivery-based services will replace people’s shopping at stores, and online working styles will become more popular. However, just-in-time requirements for deliveries coming from growing online businesses may lead to an increase in traffic accidents. Once the economy is re-opened, a rapid growth of automation may also be expected. Such trends mean that not only transport systems, but also our life-styles as well as our economies will become much “smarter”. It is worth exploring whether the development of a “smart” society will help transport systems and services to work in a more sustainable way, because “smartness” does not necessarily mean the same as “sustainability” (Woods, 2020).

8.3.6. Research on sustainable lifestyles

More online working and flexible working arrangements are expected. This will allow people to work at home and at the same time to take care of children, while avoiding virus infection during travel and at workplaces. This also helps to substantially reduce the crowdedness inside public transport vehicles.

According to IEA, the drop in energy demand (including transport energy demand) during the COVID-19 pandemic may result in a record annual decline in carbon emissions of almost 8% (IEA, 2020). On the other hand, a third of the global population had to stay at home because of the lockdown (Kaplan et al., 2020). A continuous observation by the Renewable Energy World with respect to 113 homes in Austin, Texas (79 with solar and 34 without solar: 50 having Level 2 Electric Vehicle, or EV, chargers) found a maximum 20% increase in residential energy consumption in March 2020, in comparison with previous months of March (since 2017). In contrast, EV charging dropped dramatically. After the pandemic, a ‘new normal’ is anticipated, which is expected to be accompanied by dramatic changes in people’s lifestyles. The recent experience of less pollution and more blue skies may trigger people’s pro-environmental attitudes. If this is the case, energy consumption from both in-home and out-of-home activities will decrease. It is still to be seen, however, whether such dramatically changed lifestyles will result in more or less energy consumption, either in-home or out-of-home.

For some people, long periods at home during the COVID-19 pandemic has brought about a lot of stress. Such stress may be released suddenly after the pandemic is over, in the form of travel and tourism for relaxation. On the other hand, physical distancing practices may continue for a while, even after the pandemic is over. Such long-lasting practices may change people’s social networking styles, as face-to-face communications have been dramatically reduced. Meanwhile, the expected increase of online social networking will be beneficial in terms of a reduction of transport demand. Thus, there is a trade-off relationship between time use and social networking.

8.3.7. Call for world-wide, interdisciplinary and cross-sectoral collaborations

The COVID-19 pandemic is an unprecedented global crisis. It is expected that similar crises will occur in the future. Now is the time when our human society needs to take collective actions by breaking down borders of countries, sectors, laws, and disciplines. To design effective measures against public health pandemics, information sharing (between governments, firms, experts, and individuals, etc.) is extremely crucial, because we have to uncover the unknowns in terms of COVID-19 and its consequences as much as possible. Such information should be regarded as global public goods. For effective information sharing, consensus building is essential, but it must be speedy. To make this possible, preparedness drawing on lessons from history, and mutual learning among countries of the world, are key. To prepare effectively for future public health pandemics, world-wide, interdisciplinary and cross-sectoral collaborations are urgently required.
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Appendix A. Major contents of the expert survey

| Categories                          | Detailed question items                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preparedness                        | Which of the following transport modes or systems in your city/town had guidelines for public health threats that were already prepared before the COVID-19 pandemic [multiple choices]? |
|                                     | - Aviation system                                                                                                                                     |
|                                     | - Maritime system: Passenger                                                                                                                         |
|                                     | - Maritime system: Freight                                                                                                                           |
|                                     | - River/canal transport system                                                                                                                       |
|                                     | - Rail transit system (e.g., railway, subway, street car)                                                                                           |
|                                     | - Bus system                                                                                                                                          |
|                                     | - Expressway, motorway, highway                                                                                                                      |
|                                     | - Logistics facilities                                                                                                                               |
|                                     | - Taxis                                                                                                                                               |
|                                     | - Paratransit mode: auto rickshaw, Jeepney, tuk tuk, etc.                                                                                           |
|                                     | - No guidelines for the above systems                                                                                                               |
|                                     | - Do not know                                                                                                                                       |
|                                     | - Others                                                                                                                                              |
|                                     | When the transport and logistics services are interrupted by a public health pandemic, the daily life activities of millions of individuals are affected. Therefore, contingency planning to respond to such disruptions is required. In your city/town, which of the following transport modes or systems had contingency plans that were already prepared before the COVID-19 pandemic [multiple choices]? |
|                                     | - Aviation system                                                                                                                                     |
|                                     | - Maritime system: Passenger                                                                                                                         |
|                                     | - Maritime system: Freight                                                                                                                           |
|                                     | - River/canal transport system                                                                                                                       |
|                                     | - Rail transit system (railway, subway, street car)                                                                                                 |
|                                     | - Bus system                                                                                                                                          |
|                                     | - Expressway, motorway, highway                                                                                                                      |
|                                     | - Logistics facilities                                                                                                                               |
|                                     | - Taxis                                                                                                                                               |
|                                     | - Paratransit mode: auto rickshaw, Jeepney, tuk tuk, etc.                                                                                           |
|                                     | - No contingency plan for the above systems                                                                                                          |
|                                     | - Do not know                                                                                                                                       |
|                                     | - Others                                                                                                                                              |

During-pandemic measures: Associated with the impacts

- Was your city/town locked down, is it currently locked down, or will it be locked down, because of the spread of COVID-19? (Lockdown and its timings (start and end dates))
- In the case of lockdown, what type of restrictions are put on mobilities?
  - limit on people who can go outside
  - limit on number of times to go out
  - no physical exercise or walking dogs outside house/apartment
  - medical emergencies allowed
  - medicine retrieval allowed
  - shopping of daily necessities allowed
  - closure of schools
  - closure of factories
  - closure of offices
  - closure of stores
  - others

Declaration of a state of emergency and its timings: [5] residence country [6] residence city/town

Activities/facilities prohibited to perform/use under the current COVID-19 pandemic in residence city/town
- gastronomical services: e.g., restaurant, barbecue at a park
- cultural events: e.g., concert, exhibition, festival
- sports events
- amusements: e.g., casino, bar, night club
- retail shops
- physical exercise or walking dogs outside house/apartment
- schools
- libraries
- offices
- factories
- others

Measures taken in residence city/town against COVID-19
- Military forces were or have been dispatched to transport emergency logistics materials.
- Military forces were or have been dispatched to take care of emergency medical services.
- Stay-at-home campaign has been propagated across the whole city/town.

(continued on next page)
| Categories                              | Detailed question items                                                                                                                                                                                                 |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Experts’ additional suggestions, opinions, etc. | We would like to highly appreciate it if you could kindly give additional suggestions about the ongoing measures and the post-COVID-19 pandemic policies for recovery of the transport and logistics sector as well as long-term transport/logistics policies, and/or provide us important information sources that you want to share with us. |
| Individual attributes                  | Your research or professional field(s) [multiple choices]                                                                                                                                                                  |
|                                        | Passenger Transport                                                                                                                                                                                                      |
|                                        | Freight Transport and Logistics                                                                                                                                                                                           |
|                                        | Traffic Management, Operations and Safety                                                                                                                                                                                 |
|                                        | Transport Economics and Finance                                                                                                                                                                                            |
|                                        | Transport and Land Use                                                                                                                                                                                                  |
|                                        | Transport, Climate Change and Environment                                                                                                                                                                                 |
|                                        | Transport Planning and Policy                                                                                                                                                                                            |
|                                        | Transport in Developing and Emerging Countries                                                                                                                                                                             |
|                                        | Transport Infrastructure Design and Maintenance                                                                                                                                                                            |
|                                        | Urban and Regional Planning                                                                                                                                                                                               |
|                                        | Tourism                                                                                                                                                                                                                   |
|                                        | Energy Policy                                                                                                                                                                                                              |
|                                        | Public Health                                                                                                                                                                                                               |
|                                        | Others                                                                                                                                                                                                                     |
| Residence country, city/town           | Your main occupation(s) [multiple choices]                                                                                                                                                                                 |
|                                        | Education: university, school, college, etc.                                                                                                                                                                                 |
|                                        | Central government                                                                                                                                                                                                         |
|                                        | Local government                                                                                                                                                                                                            |
|                                        | International organization                                                                                                                                                                                                  |
|                                        | Others                                                                                                                                                                                                                     |
| Recommendations to the public in your city/town against COVID-19 | Do you observe significant modal shifts in your city/town [multiple choices]?                                                                                      |
|                                        | from public transport to car                                                                                                                                                                                                |
|                                        | from public transport to motorcycle                                                                                                                                                                                     |
|                                        | from public transport to bicycle                                                                                                                                                                                              |
|                                        | from public transport to walk                                                                                                                                                                                               |
|                                        | others                                                                                                                                                                                                                     |
| Expected long-term changes in people’s lifestyles in your residence country | How much do you agree to each of the following statements about long-term changes in people’s lifestyles in your residence country, caused by the influence of COVID-19? [fully disagree, disagree, neutral, agree, fully agree] |
|                                        | Online working (working at home, neighboring satellite offices, cafes, etc.) will become popular.                                                                                                                                 |
|                                        | Online shopping will become the most popular shopping activity.                                                                                                                                                            |
|                                        | Online services of government, bank, ticket purchase, etc. Will become a standard service.                                                                                                                                  |
|                                        | Online education will be a standard model of education.                                                                                                                                                                    |
|                                        | Working hours will become longer.                                                                                                                                                                                          |
|                                        | The society will become more isolated due to the progress of online activities and smart technologies (AI, IoT, robotics, etc.).                                                                                           |
|                                        | Family bonds will be enhanced significantly.                                                                                                                                                                                 |
|                                        | Infection risk level of a job will determine job choices.                                                                                                                                                                  |
|                                        | More and more people will choose a job allowing them to mainly work at home.                                                                                                                                               |
|                                        | More and more people will choose to live far from the city center.                                                                                                                                                        |
|                                        | More and more people will out-migrate from populated cities.                                                                                                                                                              |
| Expected long-term changes in the society in your residence country | How much do you agree to each of the following statements about long-term changes in the society of your residence country, caused by the influence of COVID-19? [fully disagree, disagree, neutral, agree, fully agree] |
|                                        | More and more inter-city business trips for meetings will be replaced by online meetings.                                                                                                                                 |
|                                        | More and more intra-city business trips for meetings will be replaced by online meetings.                                                                                                                                  |
|                                        | Smart technologies (e.g., AI, IoT, robotics) will be the key to detect and sound the alarm about the occurrence of future public health threats.                                                                           |
|                                        | Social and economic systems will not return to the previous ones before COVID-19.                                                                                                                                           |
|                                        | The above changes will contribute to improving resilience and sustainability of the transport and logistics sector.                                                                                                |
|                                        | The cost structure of the transport and logistics sector may be altered dramatically to prepare for future public health threats.                                                                                      |
|                                        | The intervention of governments to transport/logistics industries will be strengthened after COVID-19.                                                                                                                     |
|                                        | The car dependence will become more obvious due to adverse reactions to crowded public transport during the COVID-19 pandemic.                                                                                           |
|                                        | Significant changes will occur, within 5 years, in transport and logistics policymaking due to lessons from COVID-19.                                                                                                         |
|                                        | The induced growth of online business and automation will lead to more unemployment.                                                                                                                                      |
| Expected long-term changes in the society in your residence country | How much do you agree to each of the following statements about long-term changes in the society of your residence country, caused by the influence of COVID-19? [fully disagree, disagree, neutral, agree, fully agree] |
|                                        | More and more inter-city business trips for meetings will be replaced by online meetings.                                                                                                                                  |
|                                        | More and more intra-city business trips for meetings will be replaced by online meetings.                                                                                                                                  |
|                                        | Smart technologies (e.g., AI, IoT, robotics) will be the key to detect and sound the alarm about the occurrence of future public health threats.                                                                           |
|                                        | Social and economic systems will not return to the previous ones before COVID-19.                                                                                                                                           |
|                                        | The above changes will contribute to improving resilience and sustainability of the transport and logistics sector.                                                                                                |
|                                        | The cost structure of the transport and logistics sector may be altered dramatically to prepare for future public health threats.                                                                                      |
|                                        | The intervention of governments to transport/logistics industries will be strengthened after COVID-19.                                                                                                                     |
|                                        | The car dependence will become more obvious due to adverse reactions to crowded public transport during the COVID-19 pandemic.                                                                                           |
|                                        | Significant changes will occur, within 5 years, in transport and logistics policymaking due to lessons from COVID-19.                                                                                                         |
|                                        | The induced growth of online business and automation will lead to more unemployment.                                                                                                                                      |
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