

Arthur D Little PRISM



The Future of Mobility post-COVID-19 – Turning a crisis into an opportunity

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Some of the most powerful and poignant images of the pandemic have shown eerily deserted city centers. Cities, and the mobility systems that serve them, have been drastically affected. Decreases of up to 90 percent in mobility demand were seen during the initial lockdowns in the first half of 2020, with drops of 40–70 percent¹ continuing during the middle and late parts of the year.



Mass-transit operators have been hit not only with massive revenue falls, but also increasing operating costs, to allow for extra health and hygiene measures and decreasing vehicle capacities to enable social distancing. Some shared mobility modes, such as car sharing, have also suffered major drops in demand, which reflects not only overall travel decreases, but also a lack of customer trust in their ability to prevent infection.

Deserted city roads and empty buses and trains were among the most striking images from pandemic lockdowns around the world. However, successful cities have a gift for adapting to radically changing circumstances – how can the crisis be used to drive more sustainable, resilient, human-centric mobility systems? Based on a major research study, this article focuses on six game changers for players in the mobility ecosystem.

As we write in March 2021, the slope of the path towards recovery is still uncertain, although it is clear that many of the changes in behavior we have seen during the pandemic, such as increased working from home, acceleration of the adoption of healthier travel modes such as cycling, and heightened concern about travel safety, will have an enduring impact. Mobility in the post-COVID-19 world is unlikely to look the same.

However, the pandemic does not have to be just a bad-news story for our cities. Throughout history, cities have been shaped by disease and disaster, and eventually emerged stronger and more resilient.

1. Apple Maps mobility trends reports, ADL analysis

Although the crisis has had tragic consequences for many people, it has also provided a unique window of opportunity to shape the future of mobility: to accelerate innovations that have been faltering and, more fundamentally, reset mobility visions and strategies to better reach the ultimate goal of more sustainable, resilient and human-centric mobility systems.

Building on a recent major study that we conducted in collaboration with the International Association of Public Transport (UITP), in this article we examine some of these opportunities and identify six “game changers” for key players in the mobility system to accelerate change.

Box 1: About the study

Between May and August 2019, Arthur D Little and its long-term partner, UITP, conducted a study of mobility post-COVID-19. The study engaged with over 70 leaders and top executives from 32 organizations across the world, covering transport authorities, mass-transit operators, “new mobility” solutions providers and professional bodies.

70+ participants from 32 organizations

1. Which **new mobility patterns** do we expect to see in the post-COVID-19 world?



2. What are the opportunities to **rethink mobility systems** to make them more sustainable, resilient and human centric?



3. How can PTOs/MSPs adapt their **offerings and operating models** to meet post-COVID-19 needs and increase resilience?



The full report of the study includes examples of more than 100 actions that transport authorities and mobility solutions providers are taking, or planning to take, in response to the crisis. The report is the fourth in a series of Future of Urban Mobility studies published by ADL and UITP regularly since 2011. It and can be found at: www.adl.com/Futureofmobilitypostcovid

How mobility patterns are changing

Our study identified 12 trends across three categories that are significantly affecting mobility patterns, as shown in Figure 1:

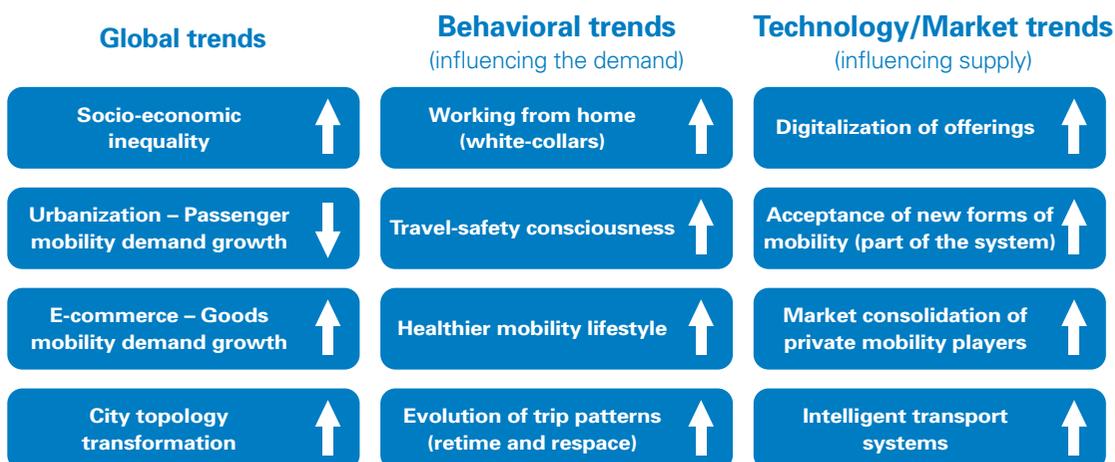


Figure 1: The impact of COVID-19 on affected urban mobility

Some of these trends are to be expected: for example, the rise in **goods-mobility demand**, including so-called micro-delivery services, driven by the explosive growth of e-commerce; greater **working from home** and more flexible working hours; adoption of **healthier mobility modes** such as walking and cycling, as well as other private mobility devices such as e-scooters; more **safety consciousness** requiring a step-change in operator cleanliness and hygiene; and **accelerated digitalization** of offerings driven by needs for more operational flexibility, resilience, personalization to suit customer needs, and reduction of physical touchpoints. However, other trends are perhaps less obvious – for example, we are likely to see an acceleration of changes in **city topology**, which will significantly affect transport patterns. (See Figure 2.)

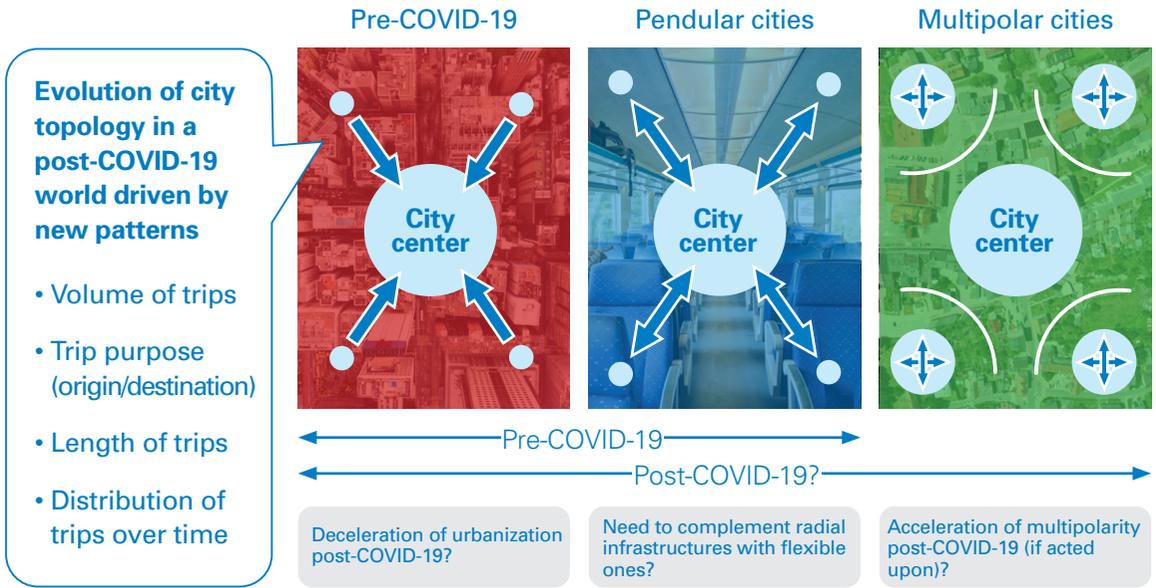


Figure 2: The impact of mobility patterns on city topology post-COVID-19

For many decades two patterns have dominated city topology: first of all, an exodus of populations from rural to metropolitan areas in pursuit of economic advantage, followed by, in recent decades, an increase in **pendularity** as dwellers move outside cities for reasons of affordability, environment, space and quality of life. This has led to huge growth in commuting for work and leisure causing congestion, especially at peak times. The pandemic is likely to accelerate the more recent trend of **multipolarity**, whereby smaller communities around the original center start to flourish and become self-sustaining, such that people have less need to commute on a regular basis. Multipolarity implies shorter travel distances to work and play, less need for heavy radial infrastructure, and more need for flexible and tailored mobility solutions.

Socio-economic inequality is also expected to increase as a result of the economic downturn from the pandemic. There will be an increasing schism between lower-income and blue-collar workers who have no choice but to revert to mass-transit systems, versus white-collar and more well-off groups who are able to either work from home or afford individual travel options.

The global and behavioral trends described above will collectively affect trip patterns. Although **passenger mobility demand** (in terms of kilometers traveled) is likely to grow more slowly compared to before COVID-19, our analysis indicates it will continue to increase, albeit at a lower rate. However, we expect some **Repurposing** of trips (fewer trips to workplaces, more for home needs), **Respacing** (more short, local trips) and **Retiming** (flattening of peak hours across all modes). Evolution of the modal split will also vary by city, depending on, for example, the proportion of white-collar versus blue-collar jobs and, in the longer term, the pace of multipolarization.

As well as accelerating digitalization of transport offerings, the pandemic has had other impacts on the supply side. There is a trend towards greater acceptance by mainstream transport authorities of **private mobility solutions providers** (e.g., on-demand services) as a valid complement to public mobility systems. During the crisis they provided much-needed flexibility and bolstered overall system resilience. There is also an expectation of accelerated **market consolidation of private mobility providers** driven by falls in revenues, and we are already seeing some examples, such as Intel acquiring Moovit (MaaS solutions). However, higher risk aversion from investors, which reflects the uncertainties in future mobility demand, may also drive private mobility providers to look for alternative financing models, including working more closely with city authorities to gain access to public subsidies.

Finally, the pandemic accelerated the need for **multimodal intelligent transport systems (ITS) integration**, including integrated ticketing, payment and real-time passenger information. Data reinforced its status as the “new oil” in order to be able to respond quickly and effectively to the crisis, and consequently there is now more openness from transport authorities towards data sharing across the mobility system. This is a critical enabler for achieving greater sustainability, resilience, and human-centricity, as we shall further explore below.

Opportunities to shape more sustainable, resilient and human-centric urban mobility systems

Looking at these trends, we can see that despite the short-term challenges, there are several factors that provide a window of opportunity to change the basic paradigms of mobility. In particular:

- The crisis has opened the eyes of many towards the possibility of different ways of working and living, reducing the trend for pendular cities. Increased public acceptance of change lowers the risk for authorities to be innovation leaders rather than laggards.
- With traffic reductions it is much easier to use city centers as “sandboxes” to trial new transport measures, including, perhaps, more controversial measures such as restricting cars.
- City authorities and private actors can leverage the momentum from raised public awareness of environmental issues during the lockdown to accelerate the transition to sustainable mobility.
- Responding to the crisis has often required rapid action, which has circumvented slow urban planning processes. Now that the “art of the possible” has been demonstrated, there is greater readiness to complement typically long-term urban and infrastructure investments with smart and impactful short- to medium-term investments.

One of the great challenges of mobility systems is that they are complex, typically comprising many different players and components with strong interrelations and interdependencies; hence, a high degree of collaboration is required between the key players to make progress. So, what should be the key priorities for, on the one hand, city governments and transport authorities and, on the other, public and private transport operators?

What should city governments and transport authorities do?

City governments and transport authorities clearly have a key role to play in setting the policies and regulations to effect change. The actions to be taken can be broadly categorized into **Framing** (regulating the system) and **Enabling** (enabling other actors), as shown in Figure 3.

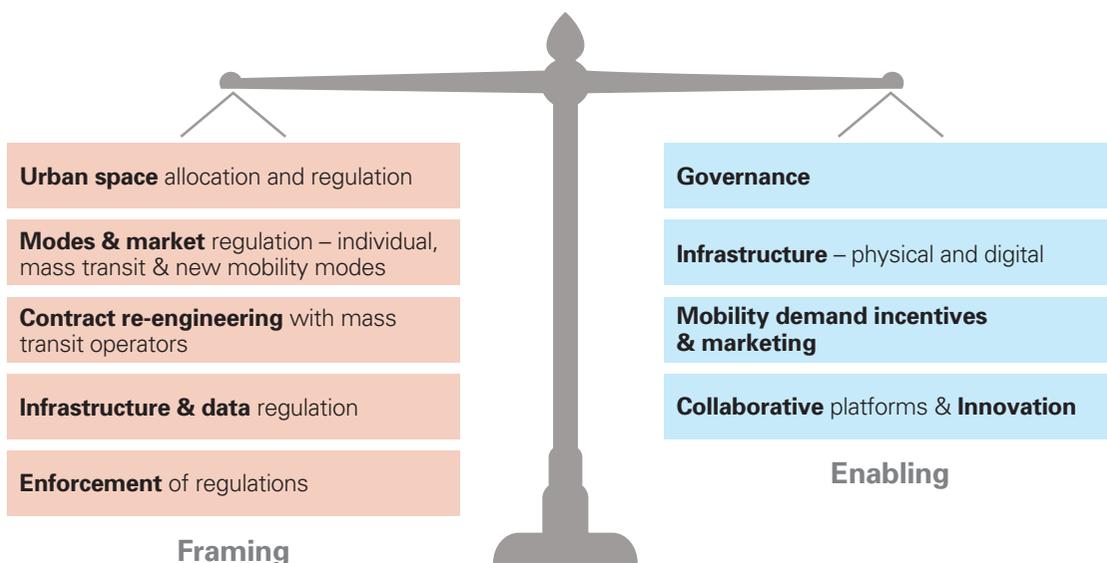


Figure 3: Framing and enabling action for authorities

Under **Framing** measures there are several key policy opportunities, including:

- *Urban space reallocation*, which includes aspects such as shifting from car-centric to human-centric streets, reorganizing to cater better for goods and logistics, and reallocation of spaces for personal and active mobility devices (such as e-scooters, e-bikes, and bicycles)
- *Modes and market regulation*, including, for example, road-user charging, intermodal planning, better regulation of “new mobility” solutions and encouragement of “test and learn” schemes
- *Contract re-engineering*, which refers especially to commercial subsidies and support for private mass-transit operators whose business models may be unable to cope with reduced post-pandemic demand

- *Infrastructure and data regulation*, such as the flexible management of parking and “curb management”, and policies to encourage open data sharing

Many city authorities are already starting to adopt these measures. For example, cities including Paris, Brussels, London, New York and Milan have introduced human-centric “soft mobility”-purposed streets. New York City has legalized e-bikes and e-scooters. Singapore and Berlin have reorganized some of their urban spaces for logistics.

Under **Enabling** measures, key opportunities include, for example:

- Rethinking overall governance models to enable better integration, efficiency and collaboration
- Investing in the right types of physical and digital infrastructure, for example, infrastructure to improve walkability, active travel modes, and suitable data platforms to support new mobility services
- New mobility demand management measures (e.g., promoting e-bikes/e-scooters, shared mobility, and peak flattening)
- Set-up of dedicated platforms to foster public/private collaborative innovation

Examples of such enabling measures include Los Angeles and Dubai, which have taken steps towards establishing unified mobility control centers for better integration and efficiency. Many cities are rapidly extending bike lanes to nudge active travel. Singapore and Madrid are accelerating development of multimodal mobility infrastructure (“mobility points”) to improve intermodality.

One prominent example of collaborative innovation through enabling infrastructure is the NEOM smart city development in Saudi Arabia. NEOM’s mobility will be powered by an underground layer of infrastructure that is embedded

with sustainable smart technology containing essential utilities and transportation services, which will allow for car-free communities and high walkability. The mixed-use communities have been designed on a human scale, in which livability and health and well-being are prioritized, with everything people need for work and play only a five-minute walk away. Energy in NEOM will be 100 percent renewable – from solar-, wind- and hydrogen-based power generation – which will ensure clean and pollution-free urban environments.

Although many cities are already pursuing some of these opportunities, few, if any, have yet been able to make a fundamental shift towards sustainability, resilience and human centricity. Our study analysis has shown that there are three overriding priorities that cities and transport authorities need to pursue to really “change the game”, as shown in Figure 4.



Figure 4: Three game changers for city and transport authorities

- **Priority #1: Think and act at system level**

City authorities need to develop unified long-term mobility visions that involve mobilization and empowerment of public stakeholders across all relevant domains (mobility, urban planning, environment, economic, social), including mass-transit operators, private service providers (on-demand, shared, micro), and representatives from businesses, associations and civil society. This requires a change of model from a pure regulator to a partnership – a major shift for many authorities. System-level regulation is needed, with a specific focus on allocation of urban space, tariff integration and data sharing. System-level execution planning is also required, for example, including multimodal master-planning and guidance on mode allocation. Mobility funding needs to consider benefits to the system as a whole.

- **Priority #2: Foster innovation through public-private collaborations on innovative technology and business model development**

City authorities need to focus even more on collaboration for innovation. This includes collaboration with providers of new technology (e.g., from AI/ML-enabled data analytics through to digital twinning and new electrification technologies); collaboration on innovative business models (e.g., Mobility-as-a-Service models, urban logistics schemes, intermodal mobility hubs); and innovation schemes, competitions and projects (e.g., trials, demonstrations, pilots, incubators, accelerators and innovation zones).

- **Priority #3: Set up a Unified Mobility Management Model, beyond MaaS, to enable real-time optimization of mobility flows and assets at city or national level**

To realize the necessary system-level perspective and overcome the obstacles, shared data and governance is key. To that end, a new Unified Mobility Management Model² is needed. This model is centered around establishing a **master mobility “data lake”** accessible to all players, supported by the necessary standards and protocols to enable free data exchange, as well as data security, ethical use of data, etc. Importantly, there is a **shared public back end**, in which common MaaS functionalities (planning, booking, payment, information) are combined with steering and enforcement mechanisms across the system, with decision-making informed by suitable algorithms. At the front end, different mobility service providers continue to interface with the customer, including goods as well as people. The model requires a **unified collaborative governance approach** to steer the system, involving all the system players as well as user representatives.

What should mobility operators and solution providers do?

Once mobility operators and solution providers have addressed the short-term pressures of post-COVID-19 falls in demand and revenues, they should make improvements focusing on two overall objectives: improving **commercial offerings** and increasing **resilience** in the face of a more uncertain future, as shown in Figure 5.

2. More details on the Unified Mobility Management Model can be found in our full Future of Mobility Post-COVID-19 study at <https://www.adlittle.com/en/future-mobility-post-covid>

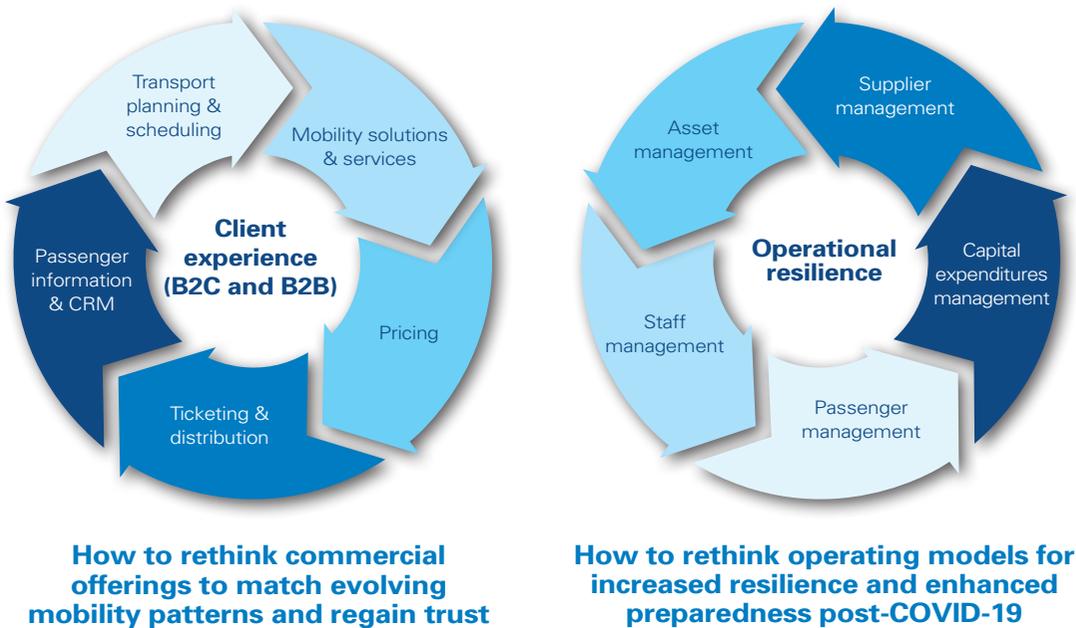


Figure 5: Key levers to rethink commercial offerings and operational resilience post-COVID-19

Under **commercial offerings**, key opportunities include:

- Flexibilization and adaptation of offers to better align with changing customer needs
- Providing new mobility solutions and services, for example, more on-demand services and mobility-as-a-service (MaaS, see Box 2) to replace fixed routes
- Using pricing to incentivize multimodal trips to benefit the overall system, and promotions and incentives to rebuild patronage
- Acceleration of digitalization, including new pre-booking processes, better data analytics and predictive capabilities to enhance quality and timeliness of services
- Improvement of passenger information, analytics and customer relations management

Many operators are already offering, or planning to offer, flexible and on-demand services, either as replacements of fixed routes (such as Shenzhen with school transportation), or as specific complements (including BVG in Berlin and HVV in Hamburg with on-demand buses for night workers, MTR in Hong Kong with on-demand airport shuttles, and EMT in Madrid with on-demand buses to hospitals). Throughout the world, advanced passenger information systems are being accelerated, and social distancing features have been integrated into MaaS solutions across the world (for example, Iomob, SkedGo and Trafti).

Box 2: Mobility-as-a-Service to be part of the new normal?

Mobility-as-a-Service (MaaS) refers to the concept of urban residents abandoning personal transport in favor of access to a range of tailored transport services via a unified platform. MaaS has huge potential to move towards the goals of sustainability, resilience and human-centricity. For example, if properly framed, it can: offer users more flexibility to choose multiple mobility options, reducing congestion; enable car-free cities; allow for system-level optimization of mobility investments and assets; and enable better integration between goods logistics and passenger transport.

These advantages are especially valuable in a post-COVID-19 world where passengers may have new needs and concerns and travel patterns are rapidly changing. However, progress in MaaS deployment has, up to now, been hampered by governance issues as well as difficulties for private-led MaaS platforms in devising business models that can achieve the necessary scale to become profitable. In the future, we expect city authorities to play an increased role in framing and enabling the development of virtuous MaaS solutions.

Under **Operational resilience**, key opportunities include:

- New agile crisis management processes powered by data analytics
- New technologies for contactless accessibility, passenger identification and tracing
- Flexibilization of staff schedules and tasks
- Adaptation of procurement and spare-part management approaches
- New cleaning and sanitation approaches
- Asset repurposing (for example, using a former bus depot as a last-mile delivery warehouse)
- Adaptation of capital investment approaches to prioritize new mobility and flexible infrastructures

For example, MTR in Hong Kong is piloting new, more flexible, approaches to crisis management based on AI/ML-driven predictive analytics. It is also moving towards contactless accessibility in trains and stations, including touchless buttons and use of speech recognition. New or enhanced cleaning technologies such as self-cleaning bike handlebars, automated escalator handrail cleaning, and deep-cleaning robots are being developed and deployed by several operators.

These opportunities can be grouped into three overriding priorities for mobility operators and solution providers, as shown in Figure 6.



Figure 6: Three game changers for mobility solution providers

- **Priority #4: Build client intimacy and proactively engage**

Operators need to build better understanding of specific clients' (B2C) needs, for example, using tools such as voice of the customer and customer relationship management. Improving passenger information, such as availability, relevance, reliability, timeliness and personalization, is also key. In addition, they need to proactively engage with companies and schools to influence mobility patterns.

- **Priority #5: Accelerate digitalization of both offerings and operations for preference and resilience**

The crisis has shown the importance to operators of speeding up the digitalization of the offering to better meet customer needs, improve the experience and increase system resilience. Key aspects include digitalization of ticketing and payment (including tariff integration), passenger information, and deployment of MaaS front-end applications.

- **Priority #6: Evolve established crisis management approaches to better anticipate risks and improve resilience of operations**

During the initial stages of the crisis, traditional static risk-register-based approaches were typically inadequate in matching the pace of events. To improve the resilience of operations in future crises, operators need to introduce forward-looking risk management approaches based more on “sense, feel and react”. New AI- and ML-based technologies now have the data-handling and analytical power to make such approaches feasible. More agile and flexible methods of recovery-scenario planning and business continuity are also needed.

Insights for the executive

The COVID-19 crisis has been a defining moment for mobility in cities in many ways. Amid the damage and disruption, it has shown practically for the first time that future mobility systems could be very different. It has caused society to reflect and reassess its values and priorities in what could be a quite fundamental way, highlighting the importance of issues such as health, hygiene, the environment and home life, as well as speed, convenience and consumption.

Transport authorities have a critical role to play to accelerate change by “framing” and “enabling” the mobility system. Operators and service providers also have an important responsibility in reinventing their offerings and innovating to increase their relevance and resilience. For investors and other industries along the mobility supply chain, mobility is an interesting playing field with strong value creation potential. Achieving success will require vision, creativity, courage and entrepreneurship – but now could be our best opportunity for decades.

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