

COVID-19 Cross-Group Benchmarking Review of Recent Activities: Public Report

Introduction

Background

The purpose of this document is to help transport operators optimise their response to the ongoing COVID-19 pandemic by sharing knowledge and experience from a wide range of organisations globally, including many of the largest operators in the world's major cities. The focus is on both short-term measures to deal with specific challenges arising from the pandemic in the present, as well as on longer-term impacts, such as the funding crisis or more permanent changes to travel patterns and behaviour, that operators are having to respond to and plan for.



This document summarises recent updates and key findings related to COVID-19, sourced from the benchmarking group members and activities within the groups: over 100 metro, rail, bus and light rail operators participate in the international benchmarking groups (see Appendix A for a list of benchmarking groups and members) managed through the Transport Strategy Centre (TSC) at Imperial College London.

All information provided is anonymised to respect confidentiality rules of the benchmarking groups (unless any information has been sourced publicly).

Full references of relevant literature on COVID-19 in the transport industry are provided at the end of this document, along with a short description for each piece of research.

Contents

- 1 Introduction
- 2 TSC Editorial
- 3 Commentary on recent metro demand trends
- 4 Key findings from recent benchmarking activities on the topics of restoring demand and funding
- 5 Synthesis of practical examples used by transport providers to manage COVID-19 challenges
- 6 Endnotes
- 7 References
- 8 Contact us
- 9 Appendix A: List of Benchmarking Groups and Members

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Nearly all public transport operators will require significant additional financial support from government

The detailed benchmarking of transport operator practice helped over 100 member organisations to face the COVID-19 crisis during 2020. The initial operational responses have progressed towards more medium-term strategic challenges with several members using benchmarking evidence to support dialogue with government to reach new funding settlements.

In this report, we show that **nearly all public transport operators will require significant additional financial support from government, not only in 2020, but throughout 2021 and beyond**. Regionally, metro operators in Asia lost just 37% of revenue in 2020, but annual demand in Europe and North America was 49% and 65% lower respectively.

With **most costs being predominantly fixed** (only 30% of costs are even partially variable in the short term) rail operators are particularly financially constrained, almost universally requiring substantial increases in government support, without which essential services will be undeliverable.

With **a deeper, longer pandemic than many foresaw, and with the longer-lasting social and economic impacts** thereof, the severe financial repercussions will likely extend beyond 2021.

However, there are three key reasons to believe that **the outlook may be positive for public transport in the medium term, providing that operators and governments shape the recovery in the right way**.

Firstly, the **resilience of demand** for metros in Asia, and the pace of recovery for rail and metros in Europe during the summer of 2020, suggests a **high latent demand** for mass transit that may rebound beyond the pandemic. Demand for some Asian metros is near 90% of 2019 levels. **Operators can play an active role in regaining demand** too: Evidence from the international rail benchmarking groups has revealed plans to attract new market segments with new pricing products and targeted marketing. In this way, the transport sector has the opportunity to shape future travel patterns in a more sustainable manner (e.g. less highly peaked), rather than simply trying to regain pre-pandemic demand.

Secondly, so far most governments have been generally financially supportive. Some operators have foreseen a range of revenue recovery scenarios to steer dialogue with government. ‘Growing back better’ may be an overused phrase, but the **crisis offers operators and their governments a unique opportunity to redesign longer term funding frameworks** for public transport, for example through hypothecation of local taxes and congestion / emissions based pricing.

Thirdly, there is a compelling case to **use public transport to rebuild economies fairly. Providing affordable, reliable accessibility to cities** will support their continued success; conversely **higher fares and service cuts could stifle the economic recovery** of agglomerations that are usually net tax exporters to their national economies. The market for public transport may **shift from its focus on the “peak of the peak” demand towards more varied demand patterns and journey purposes** (and transport operators can actively influence this, as mentioned above). Its political role may tilt towards **an essential public service that fosters social equity**, especially for poorer urban areas in North America.

Until then, short-term tactical responses to the COVID-19 crisis will evolve throughout 2021, such as the need to vaccinate front line essential workers in the public transport industry and the continued introduction of mass employee testing. The TSC at Imperial will continue to ensure that the benchmarking groups will have a strong role in helping their members get through this perilous time.

Metro passenger demand – recovery remains uncertain with some operators revising demand forecasts down

Although ridership trends vary significantly by region, passenger **demand across modes generally remained low into recent months** (remaining below the highest levels during the previous recovery, as can be seen in Figures 1 and 2 from daily demand data being gathered in the metro benchmarking group), particularly in the **northern hemisphere where many countries have seen renewed restrictions** imposed by their governments in response to a resurgence of COVID-19 during the winter. In many cities, travel demand remains low and continues on a relatively flat trajectory profile similar to levels seen in December and January.

Looking ahead, demand **recovery remains extremely uncertain in the short term**: many European countries for example have started seeing a further resurgence in COVID-19 cases, and renewed restrictions on travel and movement are once again threatening to interrupt any potential recovery in the coming months.

Asia-Pacific region most optimistic about demand recovery whilst North American operators are predicting a challenging long-term outlook

On a regional level, Figure 3 shows metros’ forecast future demand for mid-2021 and mid-2022:

- Asia Pacific: metros are most optimistic about recovery and are estimating demand to return close to **2019 levels by mid-2022** on average.
- North America: metro forecasts typically show a return to only **50-60% of pre-COVID-19 demand by 2022**.

It is worth noting, however, that the extreme uncertainty surrounding demand recovery means that the scenario modelling undertaken by operators often provides a range of possible outcomes from low levels of ridership to 100% of pre

COVID-19 demand. Of course, even a return to 100% demand will for many operators still represent a fall in demand relative to demand forecast pre COVID-19 as many had previously been experiencing rapid growth.

San Francisco BART demand forecasts show a return to pre-COVID levels by 2031

BART in San Francisco forecast revenue losses due to COVID-19 to exceed USD \$1 billion by end of FY2022 with ridership likely to remain below previous expectations for 2023 and beyond: BART’s 10-year outlook shows that in the base case scenario demand is now only expected to return to pre COVID-19 levels by 2031.

With demand recovery anticipated to be much slower than previously projected towards the end of 2020, financial recovery in the long term will be extremely challenging

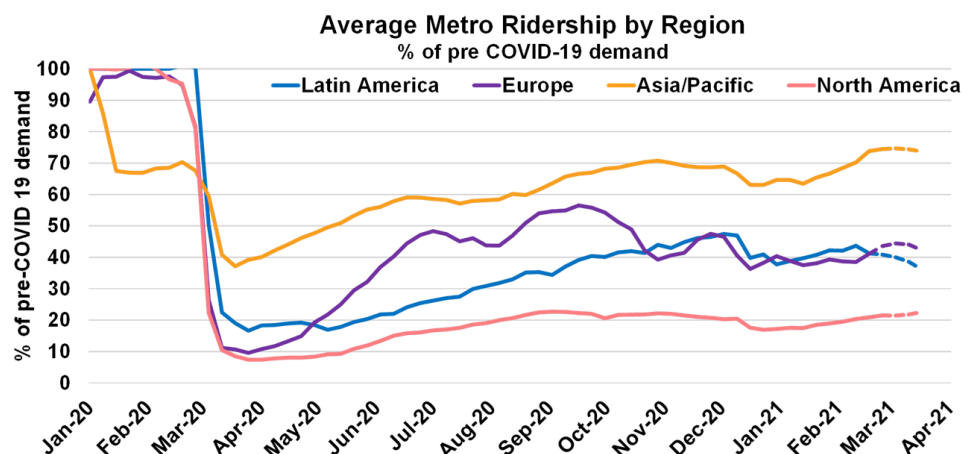
Growth of work travel vs. leisure travel

In Asian cities, where demand has recovered to a greater extent compared to other regions, there has been a faster recovery of work travel than leisure travel. For example, in one Asian city, 58% of metro passengers were commuters in 2020 vs. 51% in 2019. Possible reasons for this shift may be related to reduced tourism and ongoing fear of COVID-19 for non-essential leisure trips, or perhaps the forming of new behaviours where leisure activities are taking place at home or more locally.

However, other regions have seen a faster return to leisure travel compared to work travel, largely due to continued home working patterns. This is also true for other modes, railways for example, where there is evidence of leisure trips bouncing back faster than work trips.

Figure 1:

Average ridership by region of COMET metros as % of pre COVID-19 ridership
Source: TSC / COMET



The customer demographics of current and returning demand

Research in the metro benchmarking group identifies some common themes between metros and their customer base:

- Current metro customers who have returned to travel more quickly typically include **young, low income and minority groups with fewer alternatives to the metro** available to them.
- ‘Lapsed’ metro customers who are staying away from metro travel typically include higher income professionals and tourists.

Structural changes in demand present an opportunity for the transport sector to “shape” recovery

A benchmarking study to identify railway best practices in promoting safe travel and actions to improve the recovery of passenger numbers, investigated considerations for retaining existing demand, stimulating new demand, and indeed for encouraging (temporarily lost) demand to return.

Of particular note, is the idea that **attracting new market**

segments may be more effective than trying to regain pre-pandemic travel patterns, due to:

- structural changes in demand (e.g. increased home working), and
- demand becoming more discretionary with passengers having greater choice over whether and how often to travel.

Given the above, the transport industry (and Governments) have an opportunity to “shape” what demand is brought back.

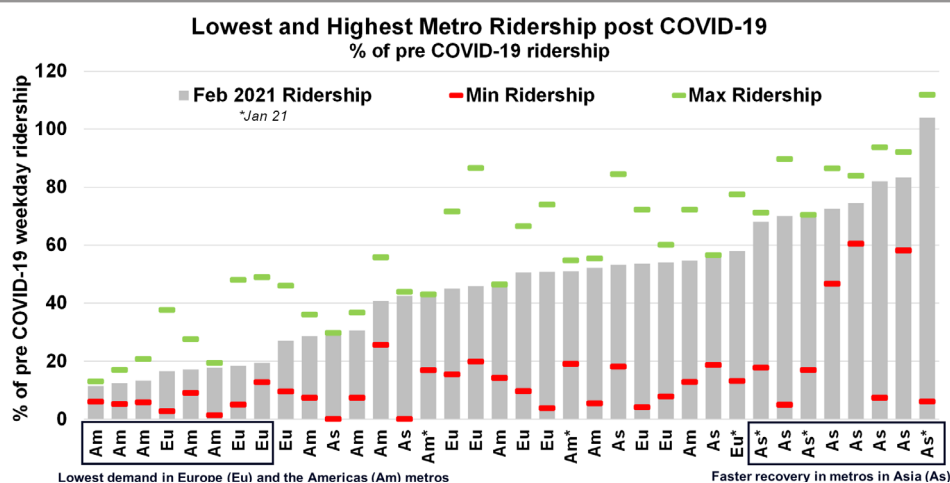
Railway views on post-pandemic demand appear to be consistent within the sector, with many suggesting **up to three years for demand to return** to pre-pandemic levels along with changes to demand profiles which is something that some railways are considering actively targeting through demand management and dynamic pricing. A more even distribution in demand and flatter peaks would present an opportunity for an **overall improvement in efficiency** for national railways, compared to the pre-pandemic situation. In the metro industry, some envisage **permanently lower demand** beyond the pandemic.

Scenario Planning

Scenario planning can help transport operators to identify the implications of different levels of post-COVID demand on their organisation: For example, as part of a research project for the

Figure 2:

Lowest and highest ridership of COMET metros as % of pre COVID-19 ridership
Source: TSC/COMET



UK rail sector, the TSC has recently developed **four demand scenarios to represent uncertainty in future commuting, business and leisure journeys** up until 2025. Estimating future demand for different market segments (journey purposes) will help operators to focus efforts on regaining demand where these will be most effective.

A member example is provided by Transport for London (TfL) which has established **six demand (and revenue) scenarios¹** for all TfL rail modes (Underground, DLR, Overground) and bus. TfL estimates percentage **changes in demand for 2024 vs 2016 to be between +9% to -32% for rail modes, and between +7% and -21% for bus:**

1. Scenario 1: A return to business as usual
 - London bounces back quickly
 - Rail demand forecast: +1%
 - Bus demand forecast: -2%
2. Scenario 2: London declines
 - Permanently lower growth resulting in lower demand
 - Rail demand forecast: -32%
 - Bus demand forecast: -21%
3. Scenario 3: Low carbon localism
 - Increased focus on sustainability and changed transport priorities
 - Rail demand forecast: -14%
 - Bus demand forecast: -5%
4. Scenario 4: Remote revolution
 - Technology radically changes how people live, work and travel
 - Rail demand forecast: -18%
 - Bus demand forecast: -13%
5. Scenario 5: Agglomeration, agglomeration, agglomeration
 - Rapid growth but inequality
 - Rail demand forecast: +9%
 - Bus demand forecast: +7%
6. Scenario 6: Hybrid (+/-)
 - Technology radically changes how people live, work and travel
 - Rail demand forecast: -15%
 - Bus demand forecast: -12%

TfL acknowledges that **London's future is unlikely to be represented by one of the first five scenarios and is more likely to be a hybrid.** Demand scenario 6 Hybrid (+/-) captures elements of scenario 1: business as usual with aspects of other scenarios covering changes to working patterns and behaviours.

Recovery Taskforce

The TSC is aware of several transport providers that have created task forces to spearhead the recovery and rebuilding efforts at their organisations:

- In one example, a dedicated 'COVID-19 Taskforce' has been set up to manage all aspects of their COVID-19

strategy. An "Incident Management Team" manages the frontline operational matters, and the "Coordination and Leadership Team" is responsible for longer-term strategic issues.

Flexible Travel and New Ticketing Products

Operators are planning for changing travel patterns and this is reflected in the emerging trend of accommodating more flexible travel through new ticket products.

Examples of new ticketing options

Several metros are exploring ticket options to accommodate increased home working replacing daily commuting. For example, one European metro is exploring new ticket options to accommodate home-working customers for whom regular monthly tickets might now be too expensive and weekly tickets provide insufficient flexibility.

An Asian metro is launching a 24-hour fare for over-65s at a reduced ticket price (-20%) to encourage the use of the metro.

Health and Safety

The most obvious way to reassure passengers about health and safety when travelling on public transport is to focus on cleanliness and safe operations.

The TSC is aware of several organisations that have gone one step further and sought formal **independent health and hygiene certifications** to rebuild the confidence of the public about health and safety standards in public transport in response to COVID-19. Many North American transit organisations have, for example, signed a pledge to implement the American Public Transportation Association's (APTA) **Health and Safety Commitments Program²** to reassure passengers.

Similarly, at least three metros have sought formal health and safety certifications:

- Metropolitano de Lisboa has been **audited and recognised by an independent body** (SGS Portugal) for its hygiene and cleaning processes during the COVID-19 pandemic. Displays stating "Travel with confidence" in stations and on trains communicate that Metropolitano de Lisboa is a safe and hygienic operator.
- Metro de Madrid's commitment to health and safety is recognised by the awarding of a **certification for good practices against COVID-19** by the Spanish Association for Standardisation and Certification (AENOR). The AENOR symbol is displayed across Metro de Madrid's facilities.

- Hong Kong MTR's hygiene efforts during the pandemic have been recognised by the **Anti-Epidemic Hygiene Measures Certification Scheme**, which is a scheme launched by the Hong Kong Quality Assurance Agency.

There are several international studies suggesting **that the risk of coronavirus spreading on public transport may have remained low through the pandemic**, for example:

- A study carried out by Santé Publique France (French Public Institute on Health Information) shows that only 1.2% of 2,830 COVID-19 clusters recorded in France between 1 May and 28 September 2020 occurred on public transport.
- Reassuring results are also provided by an Imperial College London study³ which assesses the level of SARS-CoV-2, the virus that causes COVID-19, detected on surfaces across the London Underground and bus networks using swabs and air samples. Results from previous tests have all been negative, providing some confidence in the effectiveness of current precautions (i.e. enhanced cleaning practices, wearing of face coverings, lower passenger numbers) on London's buses, trains, and in stations. The researchers do however caution the interpretation of the results, with limited sampling being one of the reasons, and emphasise that continued adherence to precautions and compliance with safety measures are important.

It should however be acknowledged that the true transmissibility of Covid-19 on public transport is not easy to identify, empirically, but projects are ongoing in several academic institutions to investigate this, as discussed above.

Several operators are centring **new communication campaigns** around the idea of rebuilding customer confidence:

- Paris RATP's new "à demain"⁴ brand (translates to "see you tomorrow") launched in October 2020 and aims to **restore the sense of togetherness and collaboration** with customers, by underlining the **"emotional bond"** between the public and RATP.
- Montréal STM's "A Heart in Motion"⁵ campaign is designed as a way of showing **solidarity to STM's front-line workers and all frontline workers in the city** and as a commitment to following hygiene rules by wearing the campaign's red heart or displaying it on social media platforms.



Source: RATP

Public transport remains an essential service yet many operators must compete for funds

The future funding outlook across the transport sector is extremely uncertain during the continuing pandemic and beyond it. The impact is highly variable between operators, but all are facing several years of negative financial outcomes; **those previously reliant on a high proportion of income from fares are most in need of financial aid.**

Work undertaken within the COMET metro benchmarking group has reviewed the impact of suppressed metro demand on revenue at the regional/global scale, with the projected losses of revenue in 2020 being:

- Asia-Pacific: -37%
- Europe: -49%
- Latin America: -56%
- North America: -65%

Figure 4 shows the average effect on metro financial performance for 2020, with average revenue projections for 2021 (given in September 2020) also shown. The outlook for 2021 is, in February 2021, likely to be poorer than expected in September 2020. In 2020, 95% of metros globally will have required either debt financing or subsidy to cover operations costs. This is expected to continue throughout 2021.

Transport providers are now also having to **compete for government funds** at a time when such funds are already strained due to the need for financial aid across industries. Examples of financial aid from governments include furlough schemes, tax reductions, deferred loan payments, or authorisation to increase debt.

London Underground's Extraordinary Funding Agreement

London Underground's fares policy is currently mandated as part of the Extraordinary Funding Agreement between TfL, the UK Government and the Mayor of London:

1. As part of the initial funding package⁶ (April to October 2020), London Underground received a GBP 1.6bn funding and financing agreement.
2. A second six month funding package (November 2020 to March 2021) has been agreed with the UK Government, under the condition that fares are increased by RPI inflation + 1% in 2021. Discussions are ongoing regarding a sustainable long-term funding model.

One study within the metro benchmarking group identified that the majority of metros obtained additional external financial support in 2020. Nevertheless, challenges around funding agreements established earlier in 2020 expiring or funds depleting have led to the **need for renewed funding packages**.

Opportunities for additional sources of funding are being identified, including **more extensive use of metro property** (e.g. selling idle buildings), **the selling of assets** (e.g. rolling stock sale and leaseback agreements), and lobbying for so-called **'hypothecated' taxes** (e.g. fuel taxes, congestion charging, sales or property taxes).

Analysis of benchmarking data highlights that metros and railways have high proportions of fixed cost, as shown in Figure 5. As such, there are likely to be relatively low opportunities for significant, short-term cost savings from reducing train service levels. Consistent with experiences in past financial crises, it makes more sense to **maximise benefits and revenues than trying to minimise costs in the short term**.

For variable costs, two key elements of metro and railway operating costs are labour and energy. Thus, the **most common strategies reported by metros to reduce labour cost** are:

- Recruitment freezes,
- Deferring expenditure on non-critical investment and/or maintenance
- Reducing overtime,
- Cutting services, but placing operating staff on government furlough schemes.

However, many longer term options for reducing labour cost require investment and/or can be expected to reduce service quality and reliability.

Options to reduce energy costs include:

- Consumption reduction strategies (e.g. lower maximum speeds),
- Reducing energy prices (e.g. changing suppliers),
- Investing directly in energy (e.g. solar panels).
- Reducing service frequencies (e.g. including overnight at weekends).

Metros have reported that **operating costs have been relatively unaffected compared to revenues** with most achieving no greater than 5-10% reductions in 2020 due to reduced service levels. In many organisations, cost savings are offset by additional costs related to cleaning and staff unavailability.

Transport providers are also developing a variety of future fare strategies. Some North American and European operators are having to implement some form of **fare increases** over the coming years to support their financial recovery, whereas metros in other parts of the world are more likely to continue with **fare freezes and promotions** to encourage customers back onto their networks and encourage accessibility back into the cities they serve.

- Transport for New South Wales, Australia, introduced a series of promotions⁷ to encourage off-peak travel:
- 50% off-peak fare discount which was reduced to a 30% discount in October 2020 (all modes)
- AUD \$8.05 cap on Saturdays, Sundays and public holidays (all modes)
- Increase in peak fares by 43% for bus and light rail trips up to 3km in length (from AUD \$2.24 to \$3.20)

Figure 4:

The impact of COVID-19 on metro financial performance and sustainability
Source: TSC/COMET

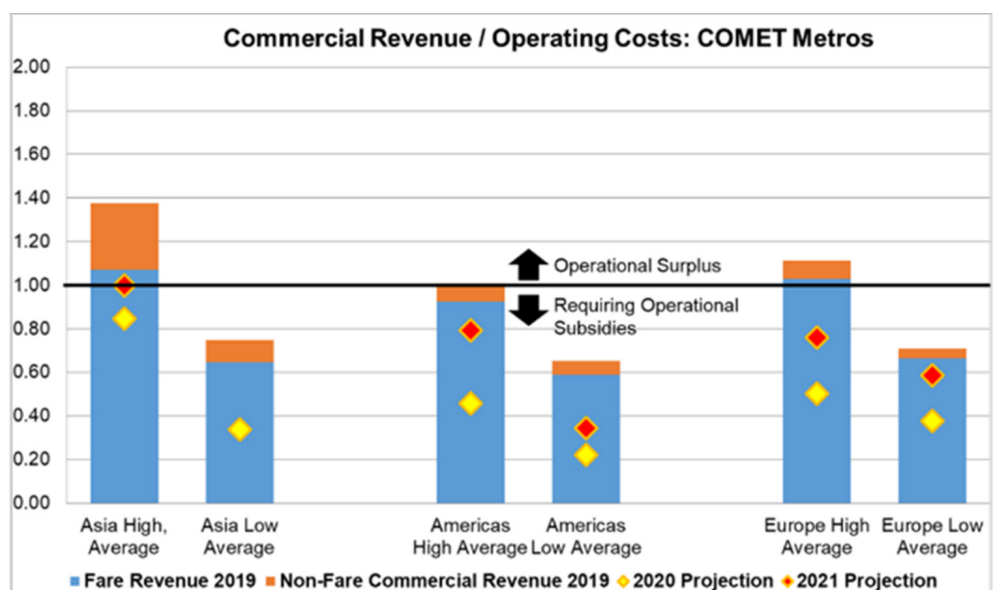
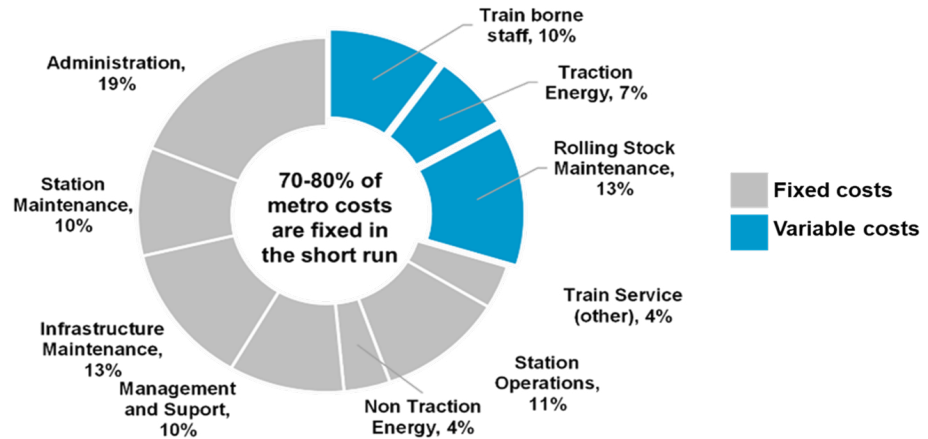


Figure 5:

Components of metro operating cost

Source: TSC/COMET



Practical examples to manage COVID-19 operational challenges

This section summarises recent information on practical examples or decisions around practices being considered by transport operators to manage the more operational challenges arising from the pandemic.

COVID-19 vaccine prioritisation

Governments typically phase vaccine prioritisation based on age and underlying health conditions rather than the nature of employment and associated level of exposure (with the exception being frontline medical workers). Within these phases, frontline transport staff, as non-medical front-line workers, are for the most part not eligible to access priority vaccinations.

Examples of priority access to vaccinations for front line transport staff are summarised below:

- **The MTA in New York began its COVID-19 vaccine distribution** on 11th January 2021:
 - Employees register in public portals to receive the vaccine.
 - Vaccines were initially being administered in state vaccination centres, and the MTA has since launched **three of its own on-site vaccination locations⁸ exclusive to the MTA workforce.**
 - In order to facilitate and minimise any service disruptions, the MTA has authorised a **special pay allowance for each hour the employees need to spend to get vaccinated**, including travel time to and from the vaccination centre, for a total of four hours (i.e. two hours per dose).
- The German Government has set up a two-phase vaccination programme:
 - Phase 1: High risk and vulnerable population
 - » Phase 1 is subdivided into three groups with **frontline transport workers in the third group.**
 - Phase 2: The rest of the population.

- In Hong Kong, the government has announced that staff in essential services who are at increased risk of exposure to COVID-19 are in the **second highest priority group⁹**. This group includes frontline transport staff.
- San Francisco BART employees are eligible to be vaccinated as part of the state’s vaccine distribution plan¹⁰ which includes essential public transport workers from 15th March 2021. State guidelines acknowledge both **the high risk to transport workers due to their occupational exposure and the importance of maintaining service.**

It is interesting to note that two studies identify public transport staff as having double the risk of becoming infected with COVID-19:

- Imperial College London’s REACT study¹¹ identifies that:
 - “Participants who worked in public transport had **double the risk of testing positive** compared with those who did not.”
- Research into COVID-19 risk by occupation¹² identifies that:
 - “Healthcare workers had a more than seven-fold higher risk of severe COVID-19; those working in social care and transport occupations had a **two-fold higher risk.**”

Transport operators are using advertisements to promote and support COVID-19 vaccination

- The Greater Dayton Regional Transit Authority (RTA) in Ohio is encouraging customer vaccine uptake by **displaying new advertisements on the exterior of buses¹³**. This messaging forms part of “Talking Buses”, a campaign launched in 2020 to communicate COVID-19 safety measures.
- Employee communications to encourage vaccine uptake amongst staff at the MTA in New York include a **promotional video fronted by Dr Fauci¹⁴**, Director of the National Institute of Allergy and Infectious Diseases in the US and chief medical adviser to the White House.

Drop-in vaccination clinics in subway and train stations

The New York MTA provided pop-up vaccination clinics¹⁵ across eight subway and train stations from 12th to 16th May 2021. Appointments for the vaccine were not needed and it was available to those aged 18 and older. As part of the initiative, those receiving the vaccine either got a free 7-day unlimited Metrocard or two one-way commuter rail tickets depending on whether the vaccine was administered in a subway or train station.

Bus access to vaccination sites are commonly supported in North America

The TSC is aware of several North American bus operators offering **free trips to vaccination sites** for the general public:

- Capital Metropolitan Transportation Authority¹⁶ in Austin and Spokane Transit Authority in Washington¹⁷ offer a **free curb-to-curb bus service** for the public to access vaccination clinics.
- Des Moines Area Regional Transit Authority¹⁸, the Greater Dayton RTA¹⁹, and Rhode Island Public Transit Authority²⁰ offer **free rides on all bus services (fixed route and paratransit)** for travel to and from a vaccination appointment. San Joaquin Regional Transit District²¹ offers **free rides on all fixed-route services** and Utah Transit Authority²² offers **free trips for travel to vaccination sites until end June 2021 (all modes)**.
- Regional Transit Service in Rochester is running one bus route as a free service (March to May 2021) as it provides access to a vaccination site.
- Jacksonville Transportation Authority is providing a **free 1-day pass**²³ to access a COVID-19 vaccination site.

Mobile Vaccination Buses

Examples of two North American bus operators that are providing **mobile vaccination buses** are:

- Greater Dayton RTA²⁴ has retrofitted a bus to provide a mobile vaccination clinic across three locations in the city.
- Jacksonville Transportation Authority launched its “Wellness on Wheels” mobile vaccination clinic²⁵ directly targeting the elderly and high risk population of the city. Two buses have been retrofitted as part of this initiative and the goal is to vaccinate 500 people per week.

Bus operator incentive for COVID-19 vaccinations in form of a month’s free travel

The Greater Dayton RTA²⁶ is rewarding fully vaccinated customers with USD 30\$ worth of credit on Tapp Pay (fare payment system) which equates to a month of free rides.

Dedicated School buses

Following the return of schools in London, London Buses has been running extra school services. In addition it **designated buses as school services and non-school services on some high frequency routes at peak times** to meet social distancing and capacity requirements.

- Buses have signage to show whether they are school services or non-school services on these routes at school times.
- Adults are asked to board non-school services and children are asked to board school services on these routes in order to maintain social distancing.
- School services have higher capacities at double the capacity of other buses.

Transport operators are not easing enhanced cleaning practices

As the COVID-19 pandemic emerged in 2020, enhanced cleaning and disinfection practices were implemented by transport operators, which have now become part of their day-to-day cleaning regimes. Whilst it is possible for transmission to occur via surface contact, evidence is increasingly suggesting that infection primarily takes place via aerosol transmission, particularly as practices and requirements around good hand hygiene, social distancing and the wearing of masks/face coverings have become more established.

Nonetheless, the majority of transport operators have not, and are not yet considering, easing their station and train surface cleaning practices, for example in terms of frequency. On the contrary, several metros have further added to their cleaning programme. Examples include:

- An Asian metro increased the cleaning and disinfection frequency at interchange stations from every four hours to every two hours.
- Two North American metros have increased the disinfection frequency for high contact surfaces from twice per day to three times per day.



Source: Greater Dayton RTA

Ventilation on Trains and Buses

- An Asian metro has conducted an on-board ventilation exchange study, the results of which confirm that the **air inside the train is completely exchanged every eight minutes when two windows in each car are kept open by 10 cm.**
- San Francisco BART has developed a marketing strategy²⁷ to demonstrate to the public that travelling with BART is safe:
 - **The air of an entire car is replaced every 70 seconds by the ventilation system** (even pre-COVID)
 - Additional technologies²⁸ have successfully been trialled, such as the implementation of **higher grade and denser filters** (MERV-14) and the use of **ultraviolet lighting** on-board trains.
- A European metro is running a trial on one train to improve ventilation by taking 60% of air from outside the car and recycling 40% of air.
- The TSC is aware of two bus organisations who are working with bus manufacturers and HVAC suppliers in providing higher rated MERV filters. One American bus operator has started testing **MERV-13** in approximately 20 buses. They note that MERV-13 filters have not been tested before in a bus organisation for the following reasons:
 - MERV-13 filters are not made for transit bus HVAC systems. Most transit bus HVAC filters are only a MERV 5-8 rating due to the volume of air flow moving through the system.
 - There is a concern that not enough airflow will pass over the cooling coils causing a decrease in AC performance, as the pilot filters capture even the smallest particles.

Specialist Coatings for High-touch Transit Surfaces

Several organisations have been trialling the use of specialist antiviral coatings on surfaces. Recent examples of antiviral coatings are provided by three organisations:

- An Asian bus company has trialled the application of an anti-microbial coating on grip poles, handles, bell buttons and steering wheels.
 - The trial continues to be effective, such that the operator's authority has **allowed for a reduction in intensity of the cleaning regime** for buses using the product.
- An Asian metro has been using a **nano-photocatalyst coating**, effective in killing a wide range of bacteria and viruses. The coating is reported to last up to three years.
- CMBC and TransLink in Vancouver are trialling the use of a copper coating and a protective coating called organosilane, on two SkyTrain cars (Millennium Line) and two trolley buses on high ridership routes.²⁹ Based on recent literature, TransLink reports that:
 - copper alloy surfaces can **destroy up to 99.9% of bacteria and viruses within four hours**, and
 - organosilane can provide **long-lasting protection** against microbes and many viruses.



Source: TransLink



Source: Hong Kong MTR

Vending Machines to Supply COVID-19 Testing Kits

Whilst vending machines to distribute face masks and PPE are a more familiar sight in stations, vending machines to distribute COVID-19 testing kits are made available at 20 stations on Hong Kong MTR's network.

Improvements to On-time Running and Dwell Times

Several metros and railways have shared insight into improved on-time performance of their services during the pandemic, believed to have resulted from reduced demand (lack of regular crowding) and dwell times:

- An Asian metro has observed an increase in on-time performance from 93% (pre COVID-19) to more than 97%.
 - This improvement is **reflected in customer satisfaction scores** increasing from 89% to 92% for the same period.
- A North American metro has seen similar improvements:
 - **Median end-to-end running time improvements** of a few minutes.
 - **Median dwell times down** by at least a few seconds at most stations and up to 15-20 seconds at big stations in peak periods.
- An Asian metro's on-time performance for two lines with the highest ridership and where punctuality is most affected by crowding during the weekday peaks was at around 99.4% in January 2020. On-time performance for these lines increased to:

- **99.7%** in February and March 2020
- **99.9%** in April 2020 when ridership on the network was at its lowest point.
- As demand recovered, on-time performance returned to previous levels at **99.4%**.
- Low levels of demand for a European metro has contributed to reduced dwell times, and in combination with a reduction in service frequency (e.g. at the peak of the pandemic earlier in the year) resulted in **late running services having less of a knock-on impact on subsequent trains.**
- Recent discussions within a benchmarking group have raised interesting questions around the **opportunities that (short term) lower patronage may have created for research and innovation**, with one railway noting that the resultant high levels of punctuality have enabled their organisation to look at restructuring their timetable, through shorter headways or turnaround times.

It will be interesting to follow up on any **emerging research on the reasons behind the improvements in punctuality** observed in metros and railways.

Endnotes

- 1 <http://content.tfl.gov.uk/financial-sustainability-plan-11-january-2021.pdf>
- 2 <https://apta.com/covid-19-resource-hub/health-safety-commitments-program/>
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Relevant COVID-19 Literature

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Description: Air and surfaces of buses and subway trains in Barcelona were tested - 30 out of 82 air and surface samples showed evidence of target RNA genes of the Sars-Cov-2 virus, with surface swabs showing more positive results than air samples. After bus cleaning, there was a reduction in positive surface swab samples, however 4 from 30 samples still yielded positive results. Further testing on the efficacy of cleaning is recommended.

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Description: COVID-19 outbreaks in Australia were found to be well predicted by mobility data - especially at locations associated with habitual travel patterns e.g. workplaces.

Contact us



The TSC at Imperial College London

The Transport Strategy Centre (TSC), previously known as The Railway and Transport Strategy Centre, was established in 1992 as a centre of excellence serving the railway industry on strategic, economic and technology issues. Today, the TSC is a globally recognised team specialising in performance benchmarking, research and policy for industry and government.

The Applied Research Team within the TSC works directly with industry to improve performance in public transport worldwide, based on a systematic process managed and facilitated by the TSC through multi-year international benchmarking projects.

Imperial College London is a global university with a world-class reputation in science, engineering, business and medicine. Well known for its excellence in teaching and research, Imperial College London is consistently rated in the top 10 universities worldwide.

Thank you for reading this report.

For any enquiries please contact the TSC.

Richard Anderson

Managing Director
richard.anderson@imperial.ac.uk
+44 (0)20 7594 6092

Alexandra Williams

Centre Support Manager
alexandra.williams@imperial.ac.uk
+44 (0)20 7 594 5995

Transport Strategy Centre

Department of Civil and Environmental Engineering
Imperial College London
South Kensington Campus
London, SW7 2AZ
United Kingdom

Appendix A

List of Benchmarking Groups and Members

COMET

Community of Metros
Benchmarking Group

American Metros

- Metrovías (Buenos Aires – Argentina)
- Washington Metropolitan Area Transit Authority (WMATA – United States)
- Sistema de Transporte Colectivo (STC – Mexico City)
- Société de transport de Montréal (STM – Canada)
- MTA New York City Transit (NYCT – United States)
- Ottawa-Carleton Transportation Commission (OC Transpo – Canada)
- Rio de Janeiro (Metrô Rio – Brazil)
- Metro de Santiago (Santiago – Chile)
- Bay Area Rapid Transit (BART – United States)
- Companhia do Metropolitano de São Paulo – Metrô (MSP – Brazil)
- Toronto Transit Commission (TTC – Canada)
- SkyTrain (BCRTC – Canada)

European Metros

- Transports Metropolitans de Barcelona (TMB – Spain)
- Berliner Verkehrsbetriebe (BVG – Germany)
- Société des Transports Intercommunaux de Bruxelles (STIB – Belgium)
- Docklands Light Railway (DLR – United Kingdom)
- Metro Istanbul San. Ve Tic. A.S. (Metro Istanbul – Turkey)
- Metropolitano de Lisboa (ML – Portugal)
- London Underground Limited (LUL – United Kingdom)
- Metro de Madrid (Spain)
- Moscow Metro (Russia)
- Tyne and Wear Metro, (Nexus – United Kingdom)
- Oslo Sporveien (Norway)
- Régie Autonome des Transports Parisiens Métro (RATP Métro – France)
- Régie Autonome des Transports Parisiens RER (RATP RER – France)

Asian Metros

- Bangalore Metro Rail Corporation Limited (BMRC – India)
- Bangkok Expressway and Metro Public Company (BEM – Thailand)
- Beijing Mass Transit Railway Operation Corp. (BMTROC – China)
- Delhi Metro Rail Corporation Ltd (DMRC – India)
- Roads and Transport Authority (RTA – United Arab Emirates)
- Guangzhou Metro Corporation (GMC – China)
- MTR Corporation Limited (MTR – Hong Kong)
- Nanjing Metro Operation Corp. (China)
- Seoul Metro (South Korea)
- Shenzhen Metro Operation Corp. Ltd (China)
- Singapore Mass Rapid Transit Corporation Ltd (SMRT – Singapore)

- Shanghai Shentong Metro Group (SSMG – China)
- Syarikat Prasarana Negara Berhad (RapidKL – Malaysia)
- Taipei Rapid Transit Corporation (TRTC – Taiwan)
- Tokyo Metro Co., Ltd. (Japan)
- Sydney Metro (Australia)
- Sydney Trains (Australia)

ISBERG

International Suburban Rail Benchmarking Group

- Ferrocarrils de la Generalitat de Catalunya (FGC – Spain)
- Queensland Rail (Australia)
- S-Tog, Danish State Railways (DSB – Denmark)
- PRASA – Metrorail (South Africa)
- MTR Hong Kong (East Rail, West Rail, Ma On Shan & Tung Chung Lines – Hong Kong)
- MTA Long Island Rail Road (LIRR – United States)
- London Overground – London Rail (United Kingdom)
- Metro Trains Melbourne (Australia)
- MTA Metro-North Railroad (United States)
- S-Bahn Munich, Deutsche Bahn (DB) Regio (Germany)
- Commuter Rail, Vygruppen (Vy – Norway)
- Bay Area Rapid Transit (BART – United States)
- Sydney Trains (Australia)
- East Japan Railway Company (JR East - Japan)

IMRBG

International Mainline Rail Benchmarking Group

- Danish State Railways (DSB - Denmark)
- Irish Rail (Ireland)
- Nederlandse Spoorwegen (NS – Netherlands)
- Société nationale des chemins de fer belges (SNCB – Belgium)
- New South Wales TrainLink (New South Wales, Australia)
- Via Rail Canada (Canada)
- V/Line (Victoria, Australia)

GOAL

Benchmarking Group of North American Light Rail Systems

- Niagara Frontier Transportation Authority (NFTA – Buffalo, NY)
- Maryland Transit Administration (MTA Maryland – Baltimore, MD)
- Calgary Transit (C Train – Calgary, AB)
- Charlotte Area Transit System (CATS – Charlotte, NC)
- Dallas Area Rapid Transit (DART – Dallas, TX)
- Edmonton Transit System (ETS – Edmonton, AB)
- Hampton Roads Transit (HRT – Norfolk, VA)
- Ottawa-Carleton Transportation Commission (OCTranspo – Ottawa, ON)
- Pittsburgh PAAC (The T – Pittsburgh, PA)
- Tri-County Metropolitan Transportation District (TriMet – Portland, OR)
- San Diego Metropolitan Transit System (MTS – San Diego, CA)
- Sound Transit (ST– Seattle, WA)
- Toronto Transit Commission (TTC – Toronto, ON)
- Utah Transit Authority (UTA – Salt Lake City, UT)



**International Bus
Benchmarking Group**

- Transport Metropolitans de Barcelona (TMB, Barcelona)
- Société des Transports Intercommunaux de Bruxelles (STIB, Brussels)
- Dublin Bus (Dublin)
- IETT İletimeleri Genel Müdürlüğü (IETT, Istanbul)
- Rapid Bus Sdn Bhd (Rapid Bus, Kuala Lumpur)
- Companhia Carris de Ferro de Lisboa (Carris, Lisbon)
- London Buses (LBSL, London)
- Societe de Transport de Montréal (STM, Montréal)
- Mosgortrans (Moscow)
- MTA – New York City Transit (NYCT) & MTA Bus (New York)
- Régie Autonome des Transports Parisiens (RATP, Paris)
- King County Metro Transit (KCM, Seattle)
- SMRT Buses (Singapore)
- Transport for New South Wales (TfNSW, Sydney)
- Coast Mountain Bus Company (CMBC, Vancouver)



**American Bus
Benchmarking Group**

- Capital Metropolitan Transportation Authority (Cap Metro – Austin, TX)
- Niagara Frontier Transportation Authority (NFTA – Buffalo, NY)
- Charlotte Area Transit Systems (CATS – Charlotte, NC)
- Des Moines Area Regional Transit Authority (DART – Des Moines, IA)
- Greater Dayton Regional Transit Authority (GDRTA – Dayton, OH)
- Lane Transit District (LTD – Eugene, OR)
- Mass Transportation Authority (MTA – Flint, Michigan)
- Foothill Transit (San Gabriel Valley, LA County, CA)
- Hampton Roads Transit (HRT – Hampton, VA)
- Jacksonville Transportation Authority (JTA – Jacksonville, FL)
- Milwaukee County Transit System (MCTS – Milwaukee, WI)
- Orange County Transportation Authority (OCTA)
- Regional Transit Service (RTS – Rochester, NY)
- Rhode Island Public Transit Authority (RIPTA – Providence, RI)
- Omnitrans (San Bernardino, CA)
- San Joaquin Regional Transit District (RTD – Stockton, CA)
- Pinellas Suncoast Transit Authority (PSTA – St. Petersburg, FL)
- Spokane Transit Authority (STA – Spokane, WA)
- Utah Transit Authority (UTA – Salt Lake City, UT)
- Clark County Public Transportation Benefit Area (C-TRAN – Vancouver, WA)



RIAMBIG

**Railway Infrastructure Asset Management
Benchmarking Group**

- Queensland Rail (Brisbane, Australia)
 - KiwiRail (New Zealand)
 - Public Transport Authority Perth (Perth, Australia)
 - Sydney Trains (Sydney, Australia)
 - V/Line (State of Victoria, Australia)
-