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TRANSIT TO NET ZERO

Designing Systems to
Attract Ridership



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ABOUT THE INFRASTRUCTURE LAB

The Infrastructure Lab brings together organizations, businesses, government and academia to discuss solutions for infrastructure challenges. With Canada making unprecedented investments, our goal is to promote constructive dialogue, and draw on shared experiences, to ultimately help drive the most value for communities, and governments, and a healthy market for the sector.

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With thanks to session participants from the following organizations:

- [Alchera Technologies](#)
- [City of Calgary](#)
- [City of Edmonton](#)
- [Commonplace](#)
- [Direct Access](#)
- [Direx Solutions](#)
- [Grimshaw](#)
- [Metrolinx](#)
- [Momentum Transport](#)
- [PriestmanGoode](#)
- [Scott Brownrigg](#)
- [Steer Group](#)
- [Systra UK](#)
- [Translink](#)
- [Transport for London](#)
- [Transport for the North](#)
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TRANSIT TO NET ZERO

Designing Systems to Attract Riders

Transport represents around a third of carbon emissions produced in both Canada and the UK. One of the most effective ways to tackle this is to encourage more people to take transit or active travel. Here are some of the key themes raised at the Canada-UK roundtable on Transit and Net Zero:

1

Customer Experience:

Transit agencies recognize that they are competing against other transport modes and organizations such as Translink have developed a customer action plan to make riders the focus of service planning and delivery. Regional agencies like Transport for the North and Metrolinx are working with local agencies to integrate fares and services to provide a more seamless user experience. Transit agencies are also learning from the air industry in using smart design to build a better, more stress-free experience.

2

Service Quality:

Agencies are leveraging digital tools and data to understand travel patterns and develop services and schedules that can make transit the most convenient option. Transport for London (TfL) and the Toronto Transit Commission are using technology to get more capacity from their existing assets, enabling them to run more trains at rush hour and reducing delays. TfL provides training for bus drivers, and invested in state-of-the-art electric buses to attract riders. Cheaper options like dedicated bus lanes making journey times more reliable also encourage people to switch modes.

3

Networks and Stations:

Transit stations are hubs of activity and the best stations like London Bridge and St Pancras are themselves becoming destinations. Stations such as Tottenham Court Road brought in accessibility experts to ensure the station was built with all end users in mind. With major investments in rail infrastructure in both Canada and the UK the stations present a one-time opportunity to attract businesses and build housing to develop vibrant mixed-use communities.

TRANSIT TO NET ZERO: CANADA AND THE UK

As towns and cities in the UK and Canada continue to grow, transit will play an increasingly important role in connecting people to jobs, supporting economic growth, and reducing environmental impact. Transport makes up around one third of emissions in Canada and the UK, and with both countries committing to reach net zero by 2050, increasing the share of people using transit and modes of active travel is one of the most effective strategies to achieve climate goals. Increasing the share of transit riders over other forms of transport has the potential to deliver many benefits for most municipalities.

Expanding transit use is the only way they can grow sustainably and reduce congestion, estimated to cost a city like Toronto CAD\$6 billion per year. The City of Leeds in Northern England found that encouraging people to switch from petrol or diesel cars to public transport is one of the most cost effective ways of cutting emissions.

London's goal is to be net zero by 2030, and as part of that ensure that 80% of all trips are made by foot, cycle, or public transport, based on the Mayor's Transport Strategy. With the city growing to 9 million people and around half of journeys into London made by car it would have added 3 million cars. The strategy is having an impact. At the start, half the journeys into London were by car and half walking or transit, now walking and transit is approaching two thirds of journeys.

Cities such as Vancouver, Toronto, Edmonton, and Calgary are all investing heavily in transit infrastructure as part of their wider city plans and to meet climate goals and other challenges including access to housing, social inclusion, and economic development. The City of Mississauga, in Ontario has invested in the Hurontario LRT under development which is catalyzing development along the corridor to help counteract sprawl and help reduce the proportion of journeys made by car or taxi that currently stands at 85%. With the LRT, and the local development it has helped spur, there is expected to be over CAD\$45 billion in construction in the city over the next 15 years.

There are many actions transit agencies can take to boost ridership, most start with a focus on the passenger and local community, including:

- 1 Customer experience:** integrated fare structure, ease of payment, prices, comfort and cleanliness, customer service, passenger information,
- 2 Service quality:** frequency, speed, reliability, connections, schedules and timetabling, service integration,
- 3 Networks and stations:** network coverage, accessibility, station design, station amenities, community integration, walkability

COVID IMPACT

Transit agencies have seen their worlds turned upside down as a result of the COVID pandemic. In Canada, transit ridership had dropped by 64% as of November 2020 from a year before, and created massive holes in revenue for transit agencies. In London, the underground normally carried 4 million people per day, this dropped to 200,000 during the height of the pandemic, and stood at around 800,000 in March 2021. A study by Systra UK of UK residents showed 45% plan to change how they travel, and 10% said they would never use transit again.

Transit agencies around the world are working hard to rebuild trust to get people back, emphasizing how clean and safe it is to travel. Transport for London has launched the “ready when you are” campaign, emphasizing all the steps taken to keep the system safe and clean. Other agencies also had campaigns to encourage safe practices and build trust, with Metrolinx in Toronto offering UV sanitation, and Translink in Vancouver testing the use of copper on surfaces to kill germs. Design firm PriestmanGoode has designed touch-free aviation style seating that uses materials and less seams to attract dirt, as well as innovative layouts to enable more social distancing.



1 CUSTOMER EXPERIENCE

Translink in Vancouver developed a Customer Experience Action Plan to provide high quality customer service to 500,000 customers a day. This covers a range of customer needs to encourage more ridership including ease of purchasing tickets, accessibility, cleanliness, comfort, convenience, customer service, information, safety, and timeliness. Transport for London has a mantra that “every journey matters” with a focus on making journeys as frictionless as possible by providing consistent signage, enabling people to pay with bankcards using tap, and having good network maps.

Designers PriestmanGoode highlight the need for transit to provide a more enticing offering for passengers and to learn from the airline industry with passenger-centric design and services to ensure transit can compete with new trends such as ridesharing and autonomous vehicles. This includes vehicles and stations using their expertise gained from working with airports and airlines to provide a more stress-free, easy to navigate customer experience for transit.

TfL has worked hard to change perceptions of bus travel to grow ridership, and have gone about this through a comprehensive approach including electrifying the fleet, increasing frequency, providing a customer friendly service, and providing training for bus drivers. As many of the costs associated with bus travel are relatively fixed, regardless of the size of the bus due to the fixed costs of the driver and maintenance, Transport for the North (TfN) is working with local transit agencies to share strategies to attract more riders.

2 ENGAGING THE COMMUNITY

As transit is about moving people, it is important to base decisions on the needs of the community, and understanding the journeys people make and why. Many cities start by ensuring that values are aligned as a basis to shape plans. Edmonton and Leeds surveyed their communities to determine strength of feelings around the need to take action on climate change, the future of their cities, and measures they would buy into.

Transport planners are leveraging digital tools to better engage with potential riders and impacted communities. For new infrastructure this has become a critical way to reach beyond the people who tend to oppose any project that could impact their lives.

Consultations should also be carried out in a way that reaches a wide cross section of the population. Direct Access Group highlights a common mistake of not asking people with disabilities how they would like to participate in consultations to ensure their input on design and services can be captured. For example, those in the deaf or hard of hearing community would most likely prefer a virtual video session or in-person session rather than completing a survey or email because sign language is their first language.

Getting community input is moving away from traditional in person events to make better use of more convenient digital channels. According to digital engagement platform [Commonplace](#), over 75% of people want to participate more in public consultations, but there are lots of barriers. By seeing neighbours participate it makes people more likely to get involved, and by providing a digital platform away from social media and opening it up to a wider demographic, it steers the conversation to a more collaborative, consensus-driven approach. In [Waltham Forest](#), London, plans to rollout bike lanes were faced with a large petition and a legal challenge. By engaging online in combination with pop-up events and community meetings the situation was turned around with a shift to 70% approval.

The input collected should form the basis of future plans and procurements. [Direx Solutions](#) highlights the need to not only get feedback from people who use transit, but those who do not to see how best to get them to change their habits. These insights help develop desired outcomes for investments in infrastructure or changes in services, rather than being overly prescriptive in designing the procurement's goals.

digital engagement

LEEDS TRANSPORT STRATEGY

Leeds City Council set ambitious targets to shift the way people travel in the development of their [Transport Strategy](#), as part of the goal of becoming carbon neutral by 2030. To encourage more people to take the train, bus, walk or cycle they recognized they needed to get a better understanding of the needs of the community. The City used a [digital engagement platform](#) to augment their in-person engagement. This allowed people to provide location specific feedback on a digital map to highlight possible barriers to them using transit or active travel more, as well as seeking feedback on specific routes, and getting input on community values and a range of interventions that were under consideration.

3 USING DATA

Cities are leveraging technology to better understand current trends in how people travel, and in particular the impact of COVID in changing habits. TfL used real-time data gathered from CCTV and other sensors and used machine learning to help model real time impacts on shifts in travel behaviour around London. This helped them to improve safety and reduce congestion and gauge the effectiveness of measures such as the congestion charge.

Crowd simulation models are also being deployed around transport stations to understand behaviours of people and what impacts those behaviours. The models look at how people realistically move around specific points like ticket machines to help provide a better user experience, anticipate issues before construction, and design better stations. Momentum Transport Consultancy provided modelling for the station at the 90,000 capacity Wembley Stadium. With a unique set of challenges this modeling helped build a better understanding of the flow of people, and how that would impact transport planning and develop evacuation plans.

smart traffic data

OXFORD ZERO EMISSION ZONE

Oxfordshire County Council is using technology from Alchera Technologies to see how the pandemic impacted travel patterns in real time to help better plan for a future with reduced emissions. It works by using live sources such as CCTV and automatic traffic counters, and leverages machine learning to identify different modes of transport including cycles, cars, buses, and trucks. This builds a comprehensive picture of what is happening at that point in time to help build more intelligent infrastructure. This data is used to develop models that can explore different scenarios, for example helping justify Oxford's decision to introduce a pilot for the UK's first zero emission zone. It has helped to shape planning around current user experiences and a better make the case for why decisions should be made.



4 ACCESSIBILITY

Accessibility of stations and services benefits all parts of society. With aging populations this will become increasingly important to enable more people to use public transit and promote independence. More accessible transit enables more people to enter the job market. Direct Access conducts universal accessibility audits and highlighted some measures to consider that would help encourage or enable more people to take transit. Quiet rooms for people with autism, washroom design for wheelchair users that meets [changing places standards](#), and tactile floor mats are examples of steps that could be taken to enable more people to take public transit. Another consideration with COVID is how to use technology given concerns on cleanliness of braille surfaces.

Transport for London has a rolling programme to provide step free access to more overground and underground rail services. This not only brings accessibility and inclusion to stations, it increases ridership and benefits everyone. Scott Brownrigg has worked to adapt stations like Tottenham Court Road, [Cockfosters and Mill Hill East](#) by understanding how passenger flow works, how people access the transit system, and having clearly telegraphed routes.

accessible stations

TOTTENHAM COURT ROAD, LONDON

As part of Transport for London's commitment to expand step-free access across underground and overground rail services. [Tottenham Court Road Station](#) in central London provided step-free access to benefit older and disabled people, as well as providing benefits for people with buggies or luggage. Disability consultancy [Direct Access](#) provided an accessibility audit as part of the design process. As well as step-free access the station incorporated improved lighting, tactile strips on platforms and stairs, contrasting handrails to help visually impaired passengers. [Scott Brownrigg](#) delivered the step-free design, improving access around the ticket hall, and new connecting routes to platforms to prepare the station for a projected 30% increase in demand.

5 SERVICE LEVELS

With a well-established legacy rail network, Transport for London has worked hard to get more from existing capacity. It is paying off. By using digital technology and advanced signalling, TfL have managed to increase the number of trains passing through Victoria Station from 25 to 36 per hour. London Underground is also introducing new trains designed by PriestmanGoode that expand capacity by up to 60% during peak times by providing walkthrough carriages, larger doors, and easier entrance and exit.

Edmonton redesigned its bus network to better serve its community by providing more direct routes and more frequent service. To supplement the new network it also launched an on-demand transit pilot project to meet demand in communities where service was reduced. The Toronto Transit Commission introduced RapidTO, a plan to improve service reliability with five bus-only lanes along priority corridors. Direx Solutions also notes that frequency and reliability of service can be more important for riders than journey times.

systems for riders

MONTREAL

The Réseau Électrique Métropolitain is a growing high frequency automated light rail network connecting Montreal. With stage one still under construction planning for stage two in the east of the Montreal will see the creation of 99km of automated rail network. The East extension aims to drive economic regeneration in the East and will connect the East of the city with the centre in 25 minutes for a journey that would take one hour 20 by car. Systra is supporting the planning by modeling ridership using innovative technology to help planners determine the best routes, level of service, and assess user choices. The aim is to design a system that will attract over 133,000 riders per day, and avoid 35,000 tonnes of GHGs each year.



6 SERVICE INTEGRATION

Many transit agencies link into local services which can have an impact on user experience that if not addressed can impact passenger numbers. Metrolinx holds a regional roundtable that shares research and analytics, looks at fare integration, regional wayfinding, and how to jointly approach challenges.

TfN links five of the UK's major cities and 22 transit agencies with different resources, serving different population densities, and facing unique challenges. TfN looked at ways to reduce barriers to travel and set up their [Integrated and Smart Travel Programme](#). This spurred improvements including smart cards for use across the system, enabling people to pay online or via apps, and providing open access to journey data for journey-planning app providers. They also encouraged local agencies to share experiences in attracting more riders through the Share North program.

To encourage regional integration in the UK's city regions the UK Government invited proposals for the £2.45 billion [Transforming Cities Fund](#). Systra UK worked with [Nottingham, Leicester, and Derby](#) on a bid that looked at over 70 options before determining the greatest benefits came from environmentally friendly bus routes, bus priority schemes, new rail lines and service patterns, cycle routes, and pedestrian and townscape enhancements.

integrating fares

METROLINX, ONTARIO

Transit services across the Greater Toronto region are provided by nine municipal services linking into the regional service provided by Metrolinx. With a fragmented fare structure and policies causing confusion and deterring ridership, Metrolinx worked with [Steer Group](#) to move towards greater integration. Integration enables riders to make better use of the entire regional network, provides an improved user experience, drives more integrated services, and significantly reduces the need for short car trips to regional stations. A business case for fare integration showed that changes could drive increased annual ridership of over 60,000 and substantial regional economic benefits.

7 STATIONS AS HUBS

The design of stations plays a critical role in attracting riders. At a functional level there needs to be an easy transition between different modes of transport. In working on [Paddington Station](#) in London, Weston Williamson + Partners redesigned the station around a “pedestrian spine” enabling visitors to easily navigate the station. They also consulted early to ensure the final plan was cohesive and built around the experience of riders and people working within the station. PriestmanGoode used its experience around airports to design spaces that reduced stress for passengers trying to navigate busy or complex transit hubs.

Stations are becoming destinations that are integrating into users’ daily lives, with services such as childcare and medical clinics located on site. Growing retail offerings are not only attracting riders, but also providing revenue streams for transit agencies. The redevelopment of [Birmingham New Street](#) featured 43 shops, and acted as a catalyst for redevelopment around the station.

reaching potential

LONDON BRIDGE STATION

London Bridge Station is the oldest station in the city and was redesigned by [Grimshaw](#) among others to accommodate over 90 million passengers a year, up from 42 million. On an operational level [Network Rail](#) extended platforms to accommodate longer trains, improving signalling, and changed the track layout to reduce the number of lines terminating at the station and allowing more onward travel to increase passenger capacity. As well as opening up the station and adding entrances to improve passenger flow, it has expanded new revenue generating retail. It incorporated 10 times as much retail space which brought in £14million in retail sales in the first quarter of 2019, and has seen a rise in overall customer satisfaction.

Ontario has ambitious plans to drive development around stations from the investments in developing more frequent all-day service. The Transit Oriented Community program is built around the province's CAD\$62 billion commitment over 10 years for transit infrastructure that includes regional rail, subways, light rail, and bus rapid transit. The goal is to increase transit ridership and reduce congestion, increase housing supply and jobs, catalyze complete communities, and capture value to offset costs. Calgary's CAD\$5 billion Green Line LRT aims to open up the South East of the city, get more people out of cars, promote community development along the line, and meet the city's goal of an 80% emissions reduction by 2050.

Most of these stations continued to add parking in line with demand, but with the growth in service Metrolinx worked with Steer Group to look at issues around station access for pedestrians, cyclists, people connecting from local transit, pickup/drop-off and park and ride to help inform future investment that supported a more sustainable mode split.

In Montreal, Momentum Transport Consultancy worked with a developer and the transit agency to support the case for an underground pedestrian connection to the metro station at Victoria sur le Parc. This link provided benefits for the mixed retail and office development and the Société de transport de Montréal as people were more likely to take transit in the harsh winter.

building networks

EDMONTON

The City of Edmonton put the development of its light rail network at the heart of its City Plan and meeting climate targets. Edmonton was the first city in North America to develop a modern light rail system with a 20km line. After a pause in development the City worked with Steer Group to plan a network connecting all parts of the city and region and enable the population to double to two million people and cope with the anticipated seven million trips made by Edmontonians per day. The plan will see 50% of new housing units added through infill, new employment concentrated along the network, the development of 15-minute districts, and a target of 50% of trips made by transit or active transport.

SUMMARY

COVID has presented a major challenge to transit agencies as ridership cratered, but fortunately decision-makers have recognized that sustained investments in improving services is an investment in the long-term. In the short-term agencies will need to rebuild trust of riders to reach pre-pandemic ridership levels.

The experience from Canada and the UK also points to a variety of actions being taken to encourage more people to take transit. These can range from low cost training for drivers, to better signage, to major investments in infrastructure upgrades or new vehicles.

The common thread in growing ridership regardless of the size or complexity of the system is around focusing on the experience of the rider. By understanding why people chose to ride transit, and why they may not, was demonstrated as the key ingredient across all aspects of the capital and operations plans of all transit agencies in both Canada and the UK. Better experience = more riders = lower transport emissions.

capacity + experience

LONDON TUBE TRAINS

As transit agencies compete with new services like rideshare they need to focus more on design and the user experience. In 2021 TfL unveiled next generation tube trains to replace the 1970s fleet. The new trains were born from the design vision of PriestmanGoode and built by Siemens to be sleek, and with passenger experience in mind. Walk through carriages and wider doors will allow people to get on and off more easily, increasing capacity of the system by enabling 23% more trains to run in peak times and 60% more passengers. Air cooled carriages and digital screens with journey information will also make for a more comfortable experience, with the added benefit of 20% less energy consumption.



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