

THE URBAN TRANSIT EVOLUTION



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Contents

About the research	2
Executive summary	3
Introduction: Urban growth demands a shift in transport strategies	4
Chapter 1: Policies before projects	6
Chapter 2: Creating a seamless transport system	8
Chapter 3: Collaboration, buy-in and public support	12
Conclusion	14

About the research

The Urban Transit Evolution is an Economist Intelligence Unit report, supported by Siemens UK, which reviews some of the urban mobility challenges facing well-established, congested cities. It provides a roadmap for city leaders to overcome these challenges, with a focus on factors to consider when making decisions around infrastructure projects and transport policies.

The report is based on desk research and in-depth interviews with city leaders and transport experts from around the world, conducted between October and December 2016. We would like to thank the following experts (listed alphabetically) for sharing their insight and experience:

- **Anne Berner**,
minister of transport, Finland
- **Célia Blauel**,
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- **Isabel Dedring**,
global transport leader, Arup
- **Jon Lamonte**,
CEO, Transport for Greater Manchester
- **Michael Müller**,
mayor of Berlin
- **Gunjan Parik**,
director of the C40 Transportation Initiative, Cities Climate Leadership Group
- **Carrin Patman**,
chair, Metropolitan Transit Authority (METRO) board, Houston, Texas
- **Ben Plowden**,
director of surface strategy and planning, Transport for London
- **Brooks Rainwater**,
National League of Cities
- **Salvador Medina Ramirez**,
urban development co-ordinator, Institute for Transport and Development Policy, Mexico
- **Ken Small**,
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Executive summary

City and national leaders are facing increasing pressure to address congestion issues in mobility infrastructure. Overcrowded roads lead to increased pollution, longer commutes and decreased productivity, all of which erode prosperity and can be a barrier to economic growth.

Many cities are attempting to reduce congestion through innovative transport policies and projects. This report explores the challenges city leaders face in choosing the right combination of solutions to address their short- and long-term urban mobility challenges. It aims to provide direction on how city leaders can navigate through these challenges and how they can work together with community groups and the private sector to transform their cities for the future.

The key findings of the report are as follows:

City leaders are placing sustainability and liveability of cities front and centre as they make critical choices about transport projects and policies. They are intent on improving the health of their citizens by reducing air pollution and encouraging residents to walk and cycle. There is also greater attention being paid to creating a fairer system for those who do not own a private vehicle, ensuring that there are convenient options for all.

At a time of shrinking budgets, city leaders can employ innovative policies and maintenance projects instead of investing in large infrastructure projects to improve transport efficiency. Policies are generally less expensive and have a far shorter gestation period, allowing for near-immediate effects on traffic flows. Congestion charging, which entails the imposition of fees for driving on motorways or using a city's public transport system during peak congestion hours, has been among the leading policies adopted. In London and Singapore, it has helped to reduce congestion dramatically.

Where infrastructure projects are deemed necessary, policymakers can take an innovative approach to financing infrastructure projects beyond traditional public-private partnerships.

Developers of the Battersea Power Station development in London, for example, partially financed the rail extension needed for their project on condition that any increases in business property tax generated by the development would be directed to financing the project.

Pilot projects are an effective way to understand the impact of rapid advances in transport technology.

Government officials in Pittsburgh, Pennsylvania are working with Uber, the ride-hailing service, to introduce self-driving taxis. Deregulation to provide residents and private players with access to their application programming interfaces (APIs) will allow developers to create new products and services to improve urban mobility.

On-demand transport services are playing an important role in closing the first-mile/last-mile gap.

The distance between the point of origin (first mile) and the destination (last mile) that prevents people from using public transport can be closed by on-demand services such as Uber. Some governments are offering subsidies to companies providing services to and from public transport stops, thereby closing the first-mile/last-mile gap.

Across policies and projects, securing buy-in from the public and other stakeholders is fundamental to their success.

Engaging the residents of a city in developing transport plans can go a long way towards minimising public push-back during the implementation phase. In Los Angeles, residents voted to introduce a half-cent sales tax increase to help finance a new rail project, and Transport for Greater Manchester has called for ideas from the public, academics and other stakeholders to develop its Greater Manchester 2040 strategy.

Introduction: Urban growth demands a shift in transport strategies

More than half the global population now resides in urban areas,¹ resulting in increasing pressure on some of the world's leading centres for finance and industry, such as London, New York, Paris, Hong Kong and Mumbai, among others. The rising popularity of some of these cities means that more people relocate there in search of better economic prospects, creating expensive and congested cities. In many of these, people endure long commutes from the more affordable suburbs or outskirts of the city into the centre.

The growth in urban congestion is lowering productivity, frustrating citizens and hampering

economic growth. Around the world, travel by road and rail increased by 40% between 2000 and 2010. By 2050 it is expected to be twice as high as in 2010.²

In extremely congested cities, such as Istanbul,

Bangkok, Moscow, Rome and London, commuting times can more than double during peak hours, which translates into more than 100 extra hours stuck in traffic every year.³ This represents a significant economic burden. A recent study estimates

the cumulative cost of congestion between 2013 and 2030 to be a staggering £2.3trn (US\$2.8trn⁴) in the US and £386bn in the UK.⁵ "A lot of a country's competitiveness is dependent on the effectiveness

£386bn

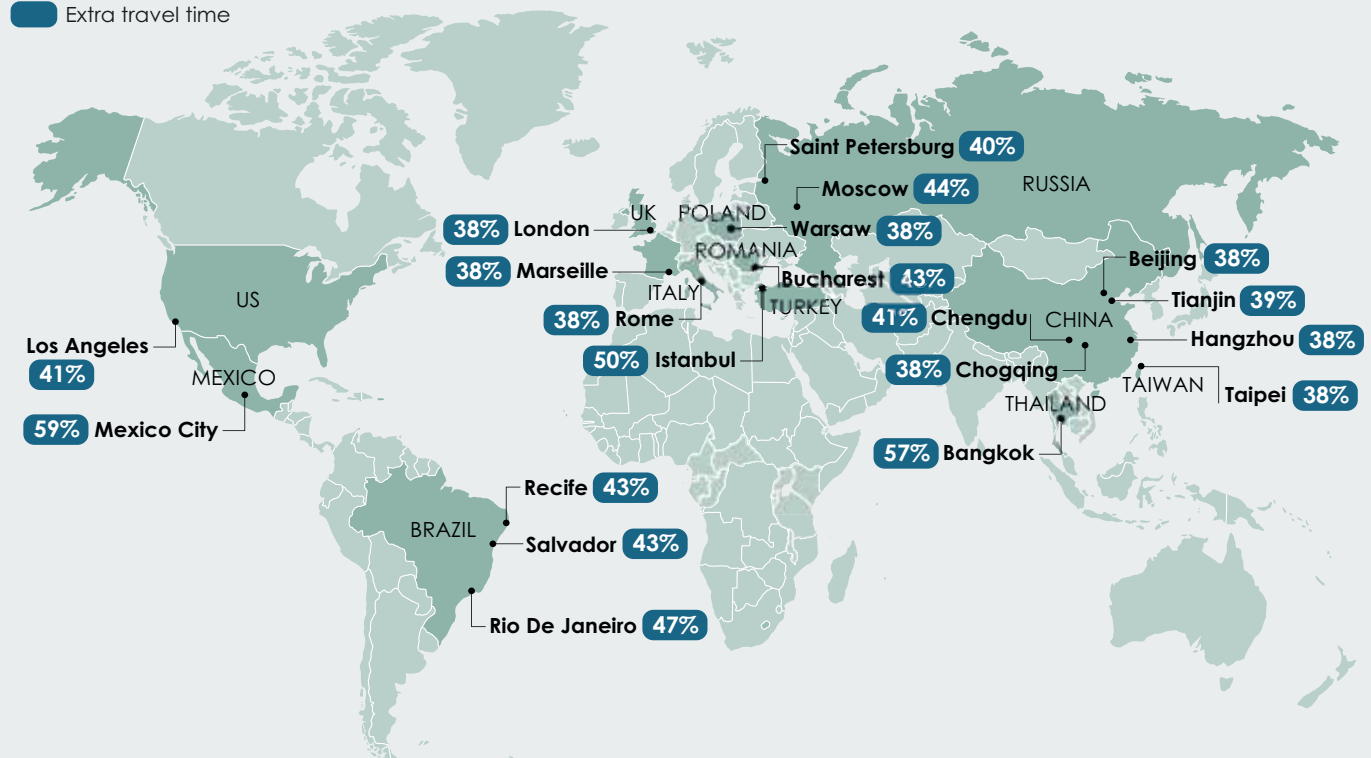
Estimate for cumulative cost of congestion in the UK between 2013 and 2030

Figure 1

Top 20 congested cities globally, 2015

(Cities with population over 800,000)

Extra travel time



Source: TomTom Traffic Index 2016.

of its transport system, how easy it is for people to move about," says Anne Berner, minister of transport for Finland. "The more speed and efficiency you have, the more dynamic you can be."

Around the world, travel by road and rail increased by 40% between 2000 and 2010. By 2050 it is expected to be twice as high as in 2010
- International Energy Agency

Congestion is also a major contributor to pollution. Transport accounts for 23% of global CO₂ emissions, more than one-half of the world's oil consumption and one-quarter of all energy use.⁷ This raises air pollution levels, which has a detrimental impact on the health of residents and is deemed to be the cause of 800,000 deaths globally each year.⁸ In London alone, the estimate stands at around 9,500 deaths annually.⁹

In Mexico City, which has the unfortunate distinction of being the most congested city in the world, air pollution levels in 2016 exceeded their limits for over three-quarters of the year,¹⁰ due in part to excessive commuter traffic. This has resulted in an increase in deaths from asthma, obstructive pulmonary chronic diseases and other respiratory conditions.¹¹

While these are extreme examples, the problem is far from unique. Globally, congestion has increased by 13% since 2008, and city leaders around the world are facing intense pressure to address this problem through more innovative public transport planning and investments. "Congestion is the number one transport issue developed cities struggle with today," says Ken Small, author of *The Economics of Urban Transport* and professor emeritus of economics at the University of California at Irvine. He cites both lack of investment in infrastructure and lack of congestion policies for these shortcomings. "They recognise that just a free-for-all, letting anybody come onto the highway doesn't work very well, but often nobody is willing to implement policies that probably would be most effective."

But the tide is turning, with more leaders now setting bold sustainability goals and introducing long-term plans to improve the "liveability" of their cities.



According to The Economist Intelligence Unit's Global Liveability Ranking, which scores 140 cities on a range of lifestyle challenges, climate and transport infrastructure are key components. Among the cities ranked the most liveable in 2016 were Melbourne and Vienna, which received the highest scores for quality of infrastructure. Therefore, in most cases, these sustainability goals tie back to transport infrastructure planning, and the need to get people out of their cars and onto walkways, bicycles and public transport.

There is also increased concern about creating a fairer system in shared city spaces for those who do not own a private vehicle, says Gunjan Parik, director of the C40 Transportation Initiative at the Cities Climate Leadership Group, a London-based network of megacity leaders working together to reduce greenhouse gas emissions. "It's about equity, and how easy we are making it for people who don't own cars to move around the city."

But there are no quick fixes. In most cases cities have to rely on a combination of solutions, including congestion charges, infrastructure investments and the use of analytics, big data and the digitisation of services to make it easier for citizens to track and use public transport systems.

For each project or policy, the benefits are incremental and can cost millions, requiring a significant change in culture and a strategic buy-in that can be difficult to muster.

Despite these challenges, many cities around the world, including London, Paris, Singapore and Mexico City, are successfully implementing a wide range of solutions that are having a real impact on congestion and the attendant environmental, social and economic issues. This report serves as a roadmap to transport policymakers, highlighting key factors to consider in an evolving transport landscape with the help of examples from around the world. Our research identified three broad strategies to consider: implementing policies before embarking on projects; creating seamless transport systems; and collaborating to secure buy-in from key stakeholders, particularly the general public. These are explored in depth in the following chapters.

Chapter 1: Policies before projects

At a time of shrinking government budgets, as lacklustre economic growth translates into austerity pressures, transport departments at both the city and the national level are looking at policies instead of projects to improve efficiency as a first step.

Compared with building new transport systems, implementing policies costs less, requires little new infrastructure and can have a near-immediate effect on congestion levels. According to Professor Small, "it is a sustainable solution". While some policies can be wildly unpopular when they are first introduced, the positive results are undeniable. In this chapter, we will look at some of the most effective policies adopted to combat city congestion.



Congestion-charging drives instant results

"Economists usually recommend [congestion] pricing as a first antidote to congestion," Professor Small says. It entails charging fees for driving on motorways or using the public transport system during peak congestion hours. These charges can be implemented through a variety of formats,

including high-occupancy toll (HOT) lanes, where drivers pay extra to use the fast lane; variable toll rates, which charge higher fees the closer it is to peak driving times; and cordon pricing, whereby drivers pay a fee to enter the city centre.

London was the first major European city to implement a congestion charge, but many other cities have since adopted similar models, including Milan, Stockholm and Gothenburg. In Asia, Beijing is currently working out the details of a proposed congestion charge to reduce vehicle emissions, using Singapore, London and Stockholm as models for its programme. Currently, no city in China charges a congestion fee, but Beijing city leaders have been exploring the issue since 2010.¹⁶

Although these programmes can be very effective, they are not a panacea, argues Isabel Dedring, global transport leader for consulting and engineering firm Arup and a former London deputy mayor for transport. "Congestion pricing is not ideal for every city," she says. And even when it works, it is only part of the solution.

Paving the way for congestion charging: The story of Singapore

Singapore was the first major city to implement a congestion-charging system in 1975. It began with a simple paper-based Area Licence System (ALS), which charged drivers a flat rate for unlimited entry into Singapore's central area. That led to an almost immediate 44% reduction in traffic and nearly doubled average driving speeds from 11mph to 21 mph.¹² The city moved to an Electronic Road Pricing (ERP) system in the late 1990s, using in-vehicle electronic sensors and smart cards to automatically deduct fees when a car entered a controlled zone. Since 2008 the city has been using analytics to adjust fee rates in real time at each of the 70 charging points to ensure that traffic moves at target speeds.

"It started with a very simple system of paper and stickers, and gradually, over time, they've made it more elaborate," says Ken Small, professor emeritus of the department of economics at the University of California at Irvine. The lesson to be learned from Singapore is "to start with something that people can understand, then refine from there to make it even better".

Singapore has served as a model for other cities eager to tackle their own congestion problems through pricing policies, including London, which introduced its Congestion Charge in 2003 and expanded the system in 2007. The charge, which applies to drivers who enter central London between 7am and 6pm on weekdays, was pushed through by the then mayor, Ken Livingstone, despite public resistance, and the results have been impressive. It reduced traffic volume by 20% during charging hours, cut 40m-50m litres of fuel consumption in the charging zone and eliminated 100,000 tonnes of CO₂ emissions annually across London.¹³ It also resulted in a significant reduction in traffic collisions,¹⁴ while generating £2.6bn (US\$3.3bn at current exchange rates) for new transport initiatives in the first ten years.¹⁵

In London, congestion charging is just one of the many interventions the city has put in place over many years. Other initiatives include investments in new transport infrastructure, such as the 225-km Thameslink railway system and Crossrail, the new high-capacity railway for London and the South-East; better maintenance programmes; the transformation of private-vehicle lanes into bus lanes and cycle paths; a stronger police presence during peak hours; and extensive high-tech traffic management tools that can adapt to traffic trends in real time.

No emissions, no problem

Congestion charging is not the only legislative tool available. Some cities have also been successful in reducing congestion by raising the cost of parking, introducing pay-for-use toll lanes, establishing rules that allow only low-emission cars into city centres, and closing roads to private vehicles.

London's Low Emission Zone (LEZ), which ensures that vehicles entering demarcated areas of the city meet certain emissions standards or pay a charge, was set up in 2008. The LEZ had a significant impact on the vehicle composition in London, as many residents replaced older vehicles with newer ones that met

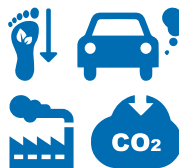


more stringent emissions standards. The impact on air quality was less conclusive,¹⁷ but London's mayor, Sadiq Khan, has plans to follow this with the introduction of an ultra-low emission zone by 2019.

Similarly, Paris has implemented Zones à Circulation Restreinte (areas with restricted traffic) to ban the most polluting cars from the city centre on weekdays. The programme uses six different stickers, ranking cars from most to least polluting. Over time, each group will be excluded, until by 2020 only zero-diesel cars will be allowed, explains Célia Blauel, vice mayor of Paris for the environment and sustainable development. The city has also begun closing roads along the Seine to all vehicular traffic, giving the riverbanks back to the people.

Paris has implemented Zones à Circulation Restreinte (areas with restricted traffic) to ban the most polluting cars from the city centre on weekdays

Ms Blauel sees these changes as part of a new way of thinking about public spaces and residents' rights to their city. "We want to create a city that is open to everybody, regardless of their economic background," she says. Limiting vehicle access to the city centre and making it easier to walk and cycle is helping Paris to achieve that goal. "We are in a collective moment of solidarity, that if you want to improve health, you want to have a city that is better to live in."



Chapter 2: Creating a seamless transport system

Beyond implementing policies to alleviate city congestion, it is often necessary to introduce system-wide changes. In the UK, for instance, the city of Manchester was able to reduce congestion in the centre through the expansion of its tram network. But when building new infrastructure, such as London's Crossrail, Rio de Janeiro's Metro Line 4 subway extension or Singapore's underground Thomson Line, numerous decisions plague city planners and policymakers. These range from project financing to system design in an evolving technological landscape. This chapter explores some of the factors that are top of the list.

Show me the money

Securing funding for massive transport projects can take years of budget negotiations. They can often be derailed by naysayers in legislative roles, new leaders voted into office midway, or public outcry over tax increases to cover costs, even if the infrastructure is sorely needed. "A lot of things don't get built because the government does not have the money to pay for them," notes Arup's Ms Dedring.

Governments have turned to public-private partnerships (PPPs) to secure private capital for transport infrastructure projects, but many have had bad experiences, she explains. There are alternative forms of partnerships between the public and the private sector beyond the traditional PPP route that are worth exploring.

In London, the developers of the £8bn Battersea Power Station project, which is turning a defunct power-plant site into an urban centre, agreed to partially fund the construction of an Underground extension to the site and two stations on condition that any increases in business property tax generated by the development would be directed to financing the infrastructure project. Developers of New York's Hudson Yards project are making similar investments in public transport to

make their developments more appealing to buyers. "These projects are basically entirely paid through the uplift in economic activity and land values in the area," Ms Dedring says. If city leaders think more strategically about the connection between urban development and public transport, they can leverage increased property values and business activity to pay for the transport infrastructure.

City leaders can leverage increased property values and business activity to pay for the transport infrastructure.

She notes that because these funding models are novel, they can be difficult to structure and secure buy-in. "The key is to have an agreement upfront with the community and the local authority." Battersea benefited from the fact that the tax already existed, so businesses were not being asked to pay more and only a portion of the additional tax generated would be spent on the transport project.

For cities that do not have the time or luxury to assemble billion-dollar development deals, there are many less costly projects that can deliver results, particularly around bus and bus rapid transit (BRT) systems. Mexico City, for example, is currently investing £121m (US\$150m) to expand its micro-bus network, replacing ageing vehicles with more environmentally friendly models to cut pollution and make the system safer and easier to use. The project builds on the success of the city's Metrobús BRT, which was implemented in 2005 and now serves 1m passengers every day. The BRT system cut travel times by 42% and is credited with mitigating 122,000 tonnes of CO2 emissions annually,¹⁸ which is critical for a city known for having some of the worst air pollution in the world.

In a conversation about costs, city leaders need to consider the impact of maintenance projects versus new infrastructure. London was able to dramatically



42%
Reduction in travel
times after launch of
bus rapid transit
system in Mexico City

enhance the capacity of its underground rail system, the Tube, by improving reliability and implementing proactive maintenance programmes rather than reactive repairs. Improvements to signalling systems on London's Victoria Line, for example, have increased the frequency of trains to 34 per hour at intervals of less than two minutes during peak times. As a result of these changes, delays fell by 40% between 2010 and 2015.¹⁹ And the launch of the Night Tube has facilitated the growth of London's "night-time economy", with new opportunities not just for entertainment, restaurants and theatres, but also for employment, such as for overnight office workers.

For governments, maintenance programmes may seem less appealing than launching a new infrastructure programme. "It's much more exciting to design a new Tube line than to figure out a way to run the trains 0.1 minutes faster," Ms Dedring says. But such maintenance projects cost a lot less and can have a significant impact.



Innovations at the end of the road

While securing funding for a project is vital, creating a seamless system requires considerable thought on system design. Efforts to improve urban mobility are directed towards increasing the usage of public transport. "The more people we can get on public transport, the better our overall roadways will operate," explains Brooks Rainwater, senior director of the National League of Cities (NLC) Centre for City Solutions and Applied Research and author of *City of the Future: Technology & Mobility*.

A key consideration is closing the first-mile/last-mile gap, which describes the distance between the point of origin (first mile) and the destination (last mile) to a public transport stop that prevents people from using public transport. "Public transport systems are becoming less about moving masses and more about moving individuals," says Finland's minister of transport, Ms Berner. Mapping an individual's journey to close that gap is therefore essential.



"Public transport systems are becoming less about moving masses and more about moving individuals," says Finland's minister of transport, Ms Berner

While many cities would love to see people walking and cycling to these stops, it is not a realistic option for everyone, especially for elderly users and cities that face harsh weather conditions. Mr Rainwater believes one potentially simple solution is the use of autonomous and on-demand vehicles to transport people to and from stops. Uber and Lyft have already begun partnering with city transport departments across the US to close that final transport gap.²⁰ The US Federal Transit Administration is helping to spur these programmes through its Mobility on Demand (MOD) project, which funds private-sector companies that create new transport solutions to connect people to public transport, including subsidies for ride-sharing services which start or end at public transport stops.²¹ In this way, the use of ride-sharing services could signal a broader shift in public transport that merges public and private offerings.

The US Federal Transit Administration is helping close the first-mile/last-mile gap through its Mobility on Demand (MOD) project, which funds private-sector companies that create new transport solutions to connect people to public transport

Helping citizens close that final gap may be a key factor in shifting the public perception of public transport. However, the benefits must be genuine. Ben Plowden, director of surface strategy and planning at Transport for London, explains: "You have to make sure that the journey quality from the minute you look on the website to discover whether your train is running to the minute you get to your office is as good as possible."

Keeping up with the Zuckerbergs

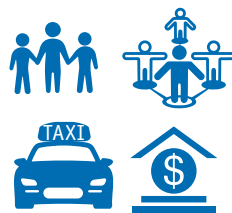
As city leaders grapple with the choices around the transport mix and system improvements, decisions around technology prove to be the most challenging. Advancements in technology—from big data to driverless cars—are disrupting the transport sector, creating a multitude of possible outcomes.

Ride-sharing services have changed the urban transport landscape, taking advantage of innovations such as big data and driverless cars. City leaders have had to accommodate the need for on-demand transport when planning urban transport projects, looking to the needs of the next generation. In Manchester, home to a large student population, Jon Lamonte, CEO of Transport for Greater Manchester, says: "A lot of them are not necessarily interested in owning vehicles, but they do want ready access to transport, and they want access to information." Mobility should be viewed as a data-driven service that provides users with a full range of transport options.



"We've been looking more closely at demand-responsive transport. Uber's here today, but we've got to think beyond Uber and what that really means," says Jon Lamonte, CEO of Transport for Greater Manchester

This includes autonomous vehicles. "Trends in driverless technology promise to change the dynamics of personal and public mobility," says Mr Rainwater. "[City planners are] trying to imagine what types of transitions we might need for [new technologies] like autonomous vehicles," although the progress of such innovations has been slow. In his 2015 report, *City of the Future: Technology & Mobility*, only 6% of large cities are shown to have plans in place for the use of autonomous vehicles. He cites pilot projects as an effective tool to test for the unknown. Government officials in Pittsburgh, Pennsylvania are working with Uber to pilot autonomous taxis. Data captured from this experiment would provide the context for future policy and investment decisions.



These projects may be on a small scale, but they suggest huge opportunities for harnessing cutting-edge technology to address long-term transport issues, and city leaders should be paying attention. "The kind of opportunities that may present themselves in 10-15 years may not be readily apparent, but we have to be ready for whatever comes next," says Mr Rainwater.

More effective modelling and forecasting are strengthening policymakers' predictive capabilities. Government officials have long relied on models

to determine how changes in population and employment translate into demand for the transport system. Recent advances in technology are supporting better data collection, which makes for more robust models and reliable analytics. Mr Plowden of Transport for London refers to the data collected from the electronic ticketing smartcard, the Oyster card, as well as from GPS-enabled buses: "We are now using both vehicle data and customer data to manage the network in real time, but also for long-term planning."

Deregulation is another strategy that is helping countries such as Finland to fast-track innovations in their transport sector. "Transport is a conservative field that has been slow to adopt new technologies and tools," says Ms Berner, who is pushing a new transport code in parliament to deregulate the public transport sector, making transport modes technology-neutral. The move would force operators to open their application programming interfaces (APIs), a set of routines, protocols and tools for building software applications, specifying how software components should interact. Through this, developers in the private sector can use existing data to create services and apps that further support public transport users.

Ms Berner notes that the biggest obstacle comes from legacy businesses such as taxi services, but she believes that deregulation is necessary to achieve innovations in the transport sector. "We have to find larger reforms that are innovation-friendly and create the growth and employment that we need."

Innovative ideas can come from multiple sources, and cities need to stay abreast of future trends, says Carrin Patman, chairman of the Metropolitan Transit Authority (METRO) board in Houston, Texas. METRO has an office of innovation that is dedicated to tracking transport innovations and new funding strategies, as well as identifying partnership opportunities to ensure that the authority does not build plans around technologies that may become obsolete in the short to medium term.

The Metropolitan Transit Authority board in Houston, Texas, has an office of innovation that is dedicated to tracking transport innovations and new funding strategies

After the wall

City planners and transport experts interviewed for this report emphasise the importance of taking the long-term view. One of these is the mayor of Berlin, Michael Müller, who states that "continuous and long-term planning is the key to making urban mobility work".

When the Berlin Wall fell in 1989, Berlin faced new transport challenges overnight, says Mr Müller. "Traffic conditions changed dramatically and overwhelmed road and rail networks. People began moving into suburbs, and car ownership rose rapidly." That led to increased congestion and a rise in noise and air pollution. "It took nearly ten years for Berlin's transport policy to catch up with these developments and start addressing new challenges," he notes. But efforts over the last two decades have transformed Berlin from a congested and polluted city into one of the most sustainable cities in the world.²²

The Berlin Senate passed its first urban transport development plan into law in 2003, which set goals to reduce car traffic in favour of public transport, cycling and walking. The plan was updated in 2011, setting a long-term goal to have carbon-free city traffic by 2025.

The city is already well on its way, Mr Müller says. Since the wall came down, Berlin has extensively expanded its bus and light rail systems and now offers 3,100 stations and stops throughout the city, longer operating hours and affordable tickets that can be purchased on the bus, via kiosks or through an app. At the same time, the city has added parking restrictions and other measures designed to encourage people to reconsider their daily traffic behaviour and to make it more expensive to drive into the city centre.

A key feature of the long-term plan is to regularly measure the impact of every project and adapt accordingly, Mr Müller says. "Each measure has an explicit aim, timeline and basic financial requirements that align with Berlin's strategic orientation to the year 2025," he says. The Senate periodically informs the stakeholders about the achievement of objectives or necessary changes.

Mr Müller argues that the only way cities can change their transport culture is by securing stakeholder support in the public and private sectors, and by looking for innovative solutions that add value within a reasonable timeframe and budget. "It is not just a question of what you can afford to build," he says, "but also what you can afford while maintaining a high quality."

Chapter 3: Collaboration, buy-in and public support

None of these urban transport success stories are being achieved in isolation. While it may take a bold leader to push through tough policies or to commandeer tax revenue for major transport-system upgrades, these projects can only be completed with the collaboration and support of key stakeholders. And that includes not only the city leadership and public-sector organisations but also—and perhaps more importantly—the public as well.

Many cities are taking steps to cement public approval. Across the US, on election day last November residents approved ballot measures that support using tax revenue for transport expansion projects.²³



In Los Angeles, voters approved a half-cent sales tax increase that will generate at least US\$860m per year for new rail construction and other transport improvement projects.²⁴

Cities are “crowdsourcing” in different ways. Chicago’s mayor, Rahm Emanuel, recently launched the Array of Things (AoT) project, in which a network of interactive, modular sensors is being installed around the city to collect real-time data that will be available to the public, enabling anyone to create new applications to improve various aspects of the city, including mobility.²⁵ “This kind of cross-functional collaboration will catalyse innovation and serve as a baseline of information as Chicago builds broader infrastructure,” Mr Rainwater says. There are also private-sector companies taking the lead in solving urban transport challenges, such as London-based start-up Citymapper, whose urban navigation app

uses publicly available data and real-time analytics to help users find a range of transport options, including bus, train, Underground and on-demand services. Having started out in London, the company now offers versions for cities across Europe, Asia and the US.

Collaboration with the public will also help to determine what future citizens will expect from their urban transport systems. “The younger generation doesn’t see personal automobile ownership as important,” Mr Rainwater says. “There is a real opportunity for policymakers to capitalise on that and to use it in their long-term transport planning.” Transport for Greater Manchester has successfully engaged the public, academics and sector experts, among others, to develop its 2040 strategy. This collaboration extends across the region, taking into consideration development plans for the “Northern Powerhouse”, which includes leading cities across the north of England. According to Mr Lamonte, “the response has probably been the highest we’ve seen in any consultation we’ve done. We’re now looking at this as a model for future consultation.” Through this it has been possible to secure a unique perspective on mobility issues in the city and ensure that it is developing effective solutions to real problems.

City leaders also acknowledge the importance of relying on their peers to offer guidance and roadmaps for what works. Through programmes such as the C40 Transportation Initiative, mayors from 90 of the world’s largest cities are working together to achieve ambitious clean-air goals by implementing low-carbon transport solutions. “Collaboration among city leaders raises their ambition and commitment,” says Ms Parik, who directs the initiative. “These mayors exercise strong powers over transport, and they are looking to each other for solutions on what works.”

Failure to secure the necessary buy-in from key stakeholders can bring the most carefully considered and sensible solutions to a halt. In 2008 the then mayor of New York City, Michael Bloomberg, attempted to implement congestion charging for cars travelling into Manhattan as part of his broader PlaNYC 2030 to improve the sustainability of the city while fostering economic growth.²⁶ It would have been the first fee-raising scheme enacted in the US, but despite receiving approval from the city and

the governor's office, it was not passed by the State Assembly. "It's almost impossible to get something like this done in the United States because we have so many levels of government, and each one effectively has a veto power," Mr Small says of the policy failure in New York. This highlights the fact that these policies need public and government support to be successful, and city leaders need strong leadership skills to push them through.

Conclusion

In an increasingly urbanising world, cities are finding it challenging to manage issues around congestion and the attendant air pollution. To improve the liveability of these cities through smart and sustainable solutions, it is critical to improve urban mobility by road and rail. An efficient transport system, particularly in large, well-established cities, can go a long way towards improving connectivity and driving economic growth. It is a complex effort that requires a range of factors to be considered. Our research points to some of the key considerations:



- **Draw clear lines between transport investments and economic vitality**

According to Professor Small, “the economic value of a transport system is really what powers cities’ economies”. Communicating with the public about the benefits these projects will bring local businesses and the economy can help overcome obstacles to winning approval. Mr Lamonte attests to this as well: “Transport is not an end in itself. It’s a means to an end. The end is economic growth for the city region.”

- **Commit for the long-term**

The cities that have seen the greatest success in transforming their urban transport systems begin with a long-term vision that considers the needs of the people, the budget and the environment. Experts suggest that city leaders should draw up an ambitious plan that includes long-term strategies and then stick to it.

- **Fix what’s broken**

City leaders may find new infrastructure projects more exciting, but making current systems more efficient—through proactive maintenance, better traffic management and technology upgrades—can often deliver significant results in a shorter period of time. To improve connectivity to new and different parts of a city or country, new infrastructure projects can be effective.

- **Use pilot projects to see what works**

Whether city leaders are interested in deploying driverless vehicles, implementing traffic management technologies or trying a new funding mechanism, starting small can help cities validate a proof of concept and hedge their bets. “As we move into the ‘urban century’, we are going to see many disruptive technologies that offer great opportunities for public transport innovation,” notes Mr Rainwater. Forward-thinking leaders who sample these technologies will be best positioned to harness them in the future.

- **Collaborate early and often**

Engaging public and private stakeholders during the planning stage can play an important role in winning approval for projects that may otherwise face a serious backlash, says Ms Blauel. City leaders should also look to their peers in other cities for advice and lessons learned. “Co-operation is very important in this space,” she says. “You can learn so much when you talk with people who have already done what you are trying to do.”

These considerations can help policymakers and authorities to develop effective transport strategies. They emphasise efficiency, transparency and inclusiveness. They call for an innovative approach to improving urban mobility against the backdrop of an evolving transport landscape. In this way, policymakers will be able to pave the way for creating truly sustainable and liveable cities.

Notes

- ¹ <http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html>
- ² https://www.iea.org/publications/freepublications/publication/TransportInfrastructureInsights_FINAL_WEB.pdf
- ³ <http://corporate.tomtom.com/releasedetail.cfm?ReleaseID=961546>
- ⁴ At a GBP/USD exchange rate of 1.2425 as on 5th January 2017. <http://www.bankofengland.co.uk/boeapps/iadb/Rates.asp>
- ⁵ <http://inrix.com/economic-environment-cost-congestion/>
- ⁶ TomTom, a Dutch manufacturer of traffic, navigation and mapping products, defines extra travel time as the additional time spent on the road during peak hours compared to an hour of driving during free flow conditions, multiplied by 230 working days per year.
- ⁷ <http://www.worldbank.org/en/topic/transport/overview#1>
- ⁸ <http://www.worldbank.org/en/topic/transport/overview#1>
- ⁹ <https://www.scribd.com/document/271641490/King-s-College-London-report-on-mortality-burden-of-NO2-and-PM2-5-in-London>
- ¹⁰ <http://www.aire.cdmx.gob.mx/default.php?opc=%27aqBhnmOkYg==%27>
- ¹¹ <http://latino.foxnews.com/latino/news/2015/06/16/air-pollution-kills-20000-people-year-in-mexico-report-says/>
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- ¹³ http://www.c40.org/case_studies/londons-congestion-charge-cuts-co2-emissions-by-16
- ¹⁴ <https://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/lums/economics/working-papers/LondonCongestionCharge.pdf>
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- ¹⁹ <https://tfl.gov.uk/info-for/media/press-releases/2016/january/lu-delivers-mayor-s-target-of-30-reduction-in-delays>
- ²⁰ <http://www.post-gazette.com/news/state/2016/09/19/Uber-finds-a-partner-with-some-public-transit-systems/stories/201609190010>
- ²¹ <http://www.smartresilient.com/public-transit-agencies-collaborating-private-sector-firms>
- ²² <https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2016/comparing-cities/>
- ²³ <http://www.t4america.org/2016/11/10/billions-in-transit-measures-approved-tuesday-unpacking-the-2016-election-results/>
- ²⁴ <http://www.latimes.com/local/lanow/la-me-ln-metro-sales-tax-increase-20160623-snap-story.html>
- ²⁵ <https://arrayofthings.github.io/faq.html>
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