CHASING URBAN MOBILITY

Moving towards a connected sustainable future

Arcadis Sustainable Cities Mobility Index 2017
Australia Pacific
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1.0 FOREWORD

Cities are in part defined by their distinct urban transport systems, installed to traverse their unique topographies and urban realities including density, demographics and design. Whether it’s London’s Tube, Los Angeles’ freeways, Hong Kong’s MTR system, Sydney’s ferries or Amsterdam’s bicycles, the elements of a city’s urban transport system are distinguishing features that enable its growth and resilience.

How efficiently residents, goods, services and travellers move throughout the city is a well-established critical success factor of how well a city functions. However, what is often missed in this discussion is how well that system will hold up for the future version of that city. In other words, how sustainable is the city’s mobility?

After a period of low to moderate investment in transport systems, Australian cities are planning, designing and innovatively funding the creation of integrated transit options to help our cities remain globally competitive. The establishment of Federal City Deals, the focus on developing polycentric economic hubs, and the investment in metro, freight and light-rail systems across the country is a clear indication that not only do our policy makers believe cities are the economic future of Australia, but that we must act quickly to move beyond global competitors.

In our 2017 Sustainable Cities Mobility Index, we focus on urban mobility – recognising that transportation is a crucial part of our daily lives, an area undergoing significant transformation globally, and a critical immediate priority for Australia’s rapidly expanding cities. Not all cities are in the same place in their urban mobility journey. Some have complex and aging systems, while others are building new networks. However, all can learn from each other and evaluate through the same criteria as a starting point.

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2.0 EXECUTIVE SUMMARY

Urban mobility is fundamental to the everyday functioning of a city, underpins wider economic performance and helps cities create a more resilient future.

Arcadis’ 2017 Sustainable Cities Mobility Index, compiled in partnership with research firm Cebr, tracks the overall performance of the mobility systems in 100 cities around the world. The index is built from 23 separate indicators grouped into three sub-indices: People, Planet and Profit.

Combining these individual metrics and sub-indices into an overall index score gives an indicative picture of the current state of a city’s urban mobility environment.

Key findings:

- Australian cities are largely middle of the road in the index, with Brisbane (48) the top ranked, followed by Sydney (51), Canberra (53), Melbourne (55) and Perth (87).
- Hong Kong takes the top spot in the overall index, places sixth in the Profit sub-index, and returns to the top spot in the People sub-index, boosted by its innovative and well-connected metro network and a high share of trips taken by public transport.
- By region, European cities most consistently rank the highest, occupying seven of the top ten spots. Zurich, Paris and Prague are the highest placed European cities, ranking second, third and fourth respectively, benefiting from strong scores in the Planet and Profit sub-indices due to established infrastructure, efficient metro systems and commitment to green technology.
- Asian cities also rank highly, taking three of the top ten spots. Modern metro systems, large airports and low usage of private vehicles help boost the rankings of developed Asian cities such as Seoul and Singapore. Other Asian cities would score higher were it not for damaging levels of urban pollution and emissions.
- Brisbane (48) was the top ranked Australian city, benefiting from a long-term plan with major infrastructure projects, including the Brisbane Metro, the European Train Control System and Cross River Rail.
- Australian cities are driving innovative funding models for future transit infrastructure, including the New South Wales Government’s strong asset recycling strategy.
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- Australian cities are driving innovative funding models for future transit infrastructure, including the New South Wales Government’s strong asset recycling strategy.
3.0 SUSTAINABLE CITIES MOBILITY INDEX

3.1 DEFINING SUSTAINABLE MOBILITY

A city can be considered to have sustainable mobility if its transit network is one that can simultaneously address and improve its functioning for all people, while also facilitating economic opportunity without compromising environmental concerns. It allows people to flow through a city; it connects workers, industries and ideas; and it provides a foundation for economic growth.

Although every city has its own distinct mobility network, built to deal with its unique environment, certain key metrics can be used to compare systems around the world. The Sustainable Cities Mobility Index seeks to do this through an indication of sustainable urban mobility that includes measures of the social, environmental and economic health of a city’s mobility: People, Planet and Profit, as shown in Figure 1.

Arcadis commissioned the Centre for Economics and Business Research (Cebr) to explore how 100 cities are performing across these three areas, measuring the social, environmental and economic health of a city's mobility across 23 indicators. For a city to achieve a high score, it must perform well for People, Planet and Profit. Scores are comparative and calculated relative to other cities in the index, thus higher scores reflect a stronger overall performance and a score of 100 does not indicate that a city is without room for improvement.

Figure 1. The three pillars of sustainable mobility

3.2 OUR RESEARCH FINDINGS

The research indicates two overarching areas of correlation:

- Australia chasing mobility: Australian cities are rapidly developing and investing in integrated mobility systems to meet the needs of the future, but are currently behind other global, comparable cities.
- Money + mass + maturity ≠ maturity: Established, large cities benefiting from high wealth do not necessarily lead the ranking in sustainable urban mobility.
- Mobility favors the bold: In every city – of every scale, density and size – leaders who are bold can choose to make real and sustainable change.
3.3 OVERALL INDEX RANKINGS

Europe dominates the top end of the index. Of the top ten places, seven are taken by European cities. Many of these European cities benefit from established and well-used metro networks such as London’s Underground, strong bicycle infrastructure in cities like Amsterdam and Copenhagen, and high shares of commuters using public rather than private transport. European cities are also environmentally conscious, with incentives to lower emissions reflected in cleaner air and greener mobility systems.

The Asian city of Hong Kong tops the index. The city’s mobility system, underpinned by a well-organised, modern and efficiently funded metro system, manages to achieve many of the aims of an effective urban transport system – enabling comprehensive mobility around a city, creating economic opportunity and enriching the lives of citizens, businesses and tourists alike.

North American cities are spread throughout the overall index, ranging from New York in 23rd place to Indianapolis in 88th. While citizens of some American cities enjoy well-funded and comprehensive transport systems, many cities in the US and Canada are undermined by a reliance on private vehicles and underdeveloped public transport options.

Most Australian cities sit around the middle of the index. A lack of comprehensive underground metro systems and dependence on private vehicles deters mobility in Australian cities, and all have less travel by foot, bike and public transport than their peer cities. Greater utilisation of urban public transport would improve mobility in cities like Perth and Canberra. Promisingly, underground metro systems are under development in Sydney and Melbourne, and under consideration in Brisbane.

South American cities sit lower in the overall index. Cities like Rio de Janeiro, Buenos Aires and Santiago are hampered by congested roads and relatively low commitment to infrastructure spending.
3.4 PEOPLE SUB-INDEX

The social and human implications of mobility systems

The People sub-index is made up of a range of metrics that reflect the implications of a mobility system for those using it. The sub-index combines key statistics, including transport coverage, reliability, hours of operation and, ultimately, the popularity of the system.

For a city’s transport network to be effective and functional for all residents, comprehensive coverage is required. Patchy transport systems mean that many residents will opt to use private transport instead.

Australian cities all performed worse than global counterparts due to a lack of developed metro rail systems. Once developed, the interconnections between metros, light rail and bus systems will provide commuters with more seamless travel and should see Australian cities move up the rankings.

Another key output of the People sub-index is modal split – the share of trips in a city taken by public transport. Cities with comprehensive public transport coverage tend to get citizens out of private vehicles, which reduces pollution and congestion. Many Asian cities score well in terms of modal split, with Tokyo and Seoul seeing more than half of total trips taken made by public transport. Australian cities, however, score relatively low, indicating a higher reliance on private transport.

Cities are also rewarded for the digital capabilities of their public transport networks in the People sub-index, assessing whether or not customers can access internet on trains and buses, use smart cards and payment systems for easier city travel, and plan trips on smartphone applications. Hong Kong’s modern metro system, which allows riders to use 3G internet in all tunnels and stations, helps the city top this sub-index.
3.5 PLANET SUB-INDEX

Environmental impacts and aims of the city’s mobility system

The Planet sub-index assesses cities in terms of a variety of environmental measures. They include current levels of greenhouse gas emissions and air pollution, efforts made to lower transport emissions including incentives for low-emissions vehicles, bicycle infrastructure and electric vehicle incentives, as well as efforts to lower levels of road congestion and increase green space covering the city.

All top ten spots in the Planet sub-index are taken by European cities, many of which benefit from their status as service-driven, developed cities. Yet many of the bolder moves taken in these cities – from fostering cycling cultures through sharing schemes to incentivizing greener vehicles – could be replicated in other cities around the world.

Conversely, all Australian cities (other than Brisbane at 48), are in the bottom 50 in the Planet sub-index. While most benefit from high levels of public and green space, which enhance pedestrian movement, and low comparable levels of air pollution, all cities suffer due to low levels of bicycle usage, and a lack of electric vehicle incentives or strategic efforts to lower transport emissions. Sydney was the worst performing Australian city on congestion, which the New South Wales Government has begun to address with several road and rail projects underway.

Many US and Asian cities are hindered by high greenhouse gas emissions, with cities like Mumbai and Chicago both scoring poorly on these measures. Many of these cities also have relatively high congestion and delays.
**3.6 PROFIT SUB-INDEX**

The efficiency and reliability of a mobility system to facilitate growth and support business

The Profit sub-index assesses the economic aspects of a city’s mobility system. This includes some key metrics for those living and working in a city, such as average commuting time, as time spent commuting usually means lost economic productivity.

This sub-index also looks at a city’s financial commitment to transport infrastructure and the financial wellbeing of the system. The sub-index assesses the utilisation of the mobility network, rewarding cities with well-used public transport.

Zurich takes first place in the Profit sub-index. This global financial centre has a highly affordable and efficient transport system, which is subsequently one of the most popular networks of any city in the overall index with a highly utilized system.

Australian cities are scattered across the Profit sub-index, with Canberra outperforming its regional counterparts at 24, and Perth performing the worst at 81. Canberra benefits from low commuting times, efficient road networks and affordable public transport.

Amsterdam is a leader in transport network efficiency, with the average commute taking under half an hour each way – in part thanks to the city’s cycle-friendly roads relieving pressure on the trams and trains.

Affordability of public transport is the strong suit of many Asian cities. In Taipei and Wuhan, a monthly travel ticket costs just 1.5 percent and 1.4 percent respectively of typical monthly earnings. This helps popularize public transport, which has a number of positive follow-on effects such as increasing the proportion of journeys made on public transport. By contrast, Londoners need to spend an average of 5.9 percent of monthly earnings to purchase a monthly pass.
While Sydney is well on its way to global city status, its middle-of-the-road ranking in this Index reflects historic under-investment in mass transit, compounded by increasingly rapid population growth – the city’s population topped five million for the first time in early 2017.

Some of Sydney’s lackluster performance can be attributed to the high concentration of professionals traveling into the Central Business District, which is on the city’s eastern coastal edge and a significant distance from Sydney’s geographical center. While initiatives from the Greater Sydney Commission and State Department of Infrastructure are driving the development of multiple business hubs, it will be some time before the benefits of these schemes are realized.

Further impacting Sydney’s mobility performance are a cultural preference for single-family dwellings and a legacy of urban sprawl, coupled with Sydney’s ranking as the second least affordable city for housing globally. These factors result in a high proportion of residents undertaking long daily commutes, thereby putting further pressure on congested suburban road and rail networks.

Notwithstanding these challenges, the New South Wales State Government is a strong believer in mobility as a driver of global competitiveness. Recently Sydney has made a major investment in mass transit networks, with an aggressive asset recycling strategy to ensure funding. The Sydney Metro project, currently the largest infrastructure project in the country, expansion of the light rail and regular train network upgrades, all demonstrate the city’s commitment to increasing the sustainability and resilience of its public transit network.

It is with this shift that Sydney performs well in the People sub-indicator compared to its Australian counterparts. And it’s through this commitment – along with better integrated land and transport planning and the smart data solutions that will ensure better intermodal connectivity – that Sydney is making steady progress towards more sustainable mobility.

WHAT CAN SYDNEY LEARN FROM SINGAPORE?
Managing strong growth and infrastructure investment

Singapore continues to be a top ranked sustainable city in Asia, but the city-state is not resting on its laurels. With a population predicted to grow to more than six million people by 2030, the government has committed significant investment over the next decade to improve mobility and connectivity: two new underground lines, extensions to four MRT (metro) lines, a new terminal and runway at Changi Airport, a high-speed rail link between Singapore and Kuala Lumpur, a cross-border MRT system which will connect Singapore and Johor Baru in Malaysia and the relocation of the container port.

66 percent of journeys in Singapore are via public transport, but the government wants to increase this to 75 percent during peak hours by 2030, and it is investing in developing a more efficient and integrated bus system.

The city is well-balanced across all three sub-indices; however, a number of other initiatives are underway which will help Singapore to evolve and remain competitive. These include the government’s intention for Singapore to go ‘car-lite’, with a S$1.5 billion 15-year plan which aims to reduce the country’s reliance on petrol-fuelled cars. The government is also generally supportive of ride-sharing car and bicycle platforms though ‘bike dumping’ is an increasing problem. The small city-state is also the perfect testing ground for driverless vehicles and the government has signed deals with two self-driving technology companies to develop autonomous truck fleets for use on public roads. Singapore is also ahead of the game in using big data to study commuter flows and improve planning, which will help guide future investment.

Overall

People

Planet

Profit
Australia’s second largest city and the capital of the State of Victoria, Melbourne has a reputation as a thriving city with strong business, cultural and sporting sectors. Melbourne has become known as the world’s most livable city, yet it ranks 55th in the Index.

One of the largest factors affecting Melbourne’s mobility is its rapid recent growth. It is projected that Melbourne’s population will double to around eight million in the next generation, overtaking Sydney as Australia’s largest city. Expanding fast and with high house prices in the city center – Melbourne has the fifth least affordable housing market in the world – the city is increasingly reliant on long-range transport options.

Melbourne boasts the world’s largest tram and light rail network and has recently begun the development of a cross-city Metro. This will help to free up the train network and enable more commuters to use public transport. Melbourne performed relatively well in the People sub-indicator compared with Australian cities (second to Sydney). This is despite the fact that the city does not yet have a functioning Metro network, a situation that will improve upon its completion. Melbourne already has a digital ticketing system and public transport mobile applications. Further digitization will ensure continued improvements to the mobility of the city.

Despite not ranking highly in several indicators, Melbourne is embracing the challenge of balancing city growth with an ability to respond to shocks and stresses. Key to Melbourne rising to its challenges is the Resilient Melbourne Strategy which sets out a clear, collaborative agenda to ensure Melbourne is in a strong position to deal with the problems of city growth. Combining this with the State Government’s Plan Melbourne refresh, the city has a strong strategy in place to address its mobility and sustainability issues.

New York City has some of the most intricate transportation networks in the U.S. and they are increasingly under strain from an expanding population, limited space, aging infrastructure and a booming economy. Key to preserving the lifeblood of New York is its connection to New Jersey, from which 400,000 residents commute into Manhattan daily to work, making transit efficiency between the two an imperative.

The Port Authority of New York and New Jersey has so far had an eventful 2017, undertaking two major airport projects. Newark Liberty International Airport broke ground on the $2.4 billion renovation of Terminal A, a project that will include new bridges, a car park and interior modernization to accommodate more passengers. Improvements to LaGuardia Airport are also underway, including a $4 billion unified terminals program, which will update insufficient facilities and provide greater capacity to meet record-breaking passenger volumes. The Authority also approved a $32.2 billion capital plan at the beginning of the year for bus terminal improvements, as part of a ten-year infrastructure strategy.

An affordable ferry service launched this year. In the future, New York is planning additional programs, such as the Gateway Program, to increase track, tunnel, bridge and station capacity between Newark, New Jersey and Penn Station, New York, a key economic corridor through which New Jersey residents commute to and from the city.

Even with these improvements, New York is still faced with major challenges to ensure its infrastructure reaches the necessary levels. A continued focus on design-build, private finance and technology are all vital for the future. For instance, the Metropolitan Transportation Authority (MTA) is implementing an enterprise asset management program to optimize asset data tracking for lower operational costs, while enhancing safety and reliability. New York leads North America in the Index. But it is also a city with a lot to lose if its planned major infrastructure projects are postponed.
BRISBANE

Brisbane ranks highest out of all the Australian cities in the Index. As the capital of Queensland, Brisbane is Australia’s third-largest city and has the most rapid population growth rate of any capital city in Australia. Established as a port within the Brisbane River, the city offers a laid-back urban lifestyle which is subtropical, creative and sustainable.

Benefitting from a diverse trade industry based on aviation, sea ports and expanding industries, Brisbane also profits from its position as the gateway to Queensland’s education and tourism industry and is a huge pull for the world’s creative and knowledge economies. Its residents and visitors enjoy an exceptional quality of life amidst the natural beauty of Australia’s eastern coast.

However, despite ranking top in Australia, Brisbane still has work to do to strengthen its infrastructure and to remain attractive, liveable, and mobile: chronic underinvestment in public transport has seen the city, alongside its southern counterparts, suffer on the global mobility stage. The mobility sub-indices show that, not only does Brisbane need to find better ways to fund public transport, it must also ensure any existing and new public transport developments are affordable and sustainable.

Aware of its mobility issues, Brisbane has a long-term plan, with major infrastructure projects including the Brisbane Metro, the European Train Control System and Cross River Rail. By delivering its major public transport infrastructure in sync with other key sustainable and smart investments, Brisbane is poised to lead the region in city development and the knowledge economy.

WHAT CAN BRISBANE LEARN FROM AMSTERDAM?

A lifestyle city embracing a Smart City approach

AMSTERDAM

A city with more bicycles than people, 58 percent of Amsterdam’s residents cycle to their destinations every day. Amsterdam’s popularity is rising; tourism is increasing and more people want to work in the city. This additional growth is creating mobility challenges. To resolve these, the city has created a mobility plan that extends until 2030. The plan gives priority to pedestrians and cyclists in the city center and better access to underground parking locations. Additional and enforced bike parking is being created, to keep the city free of unused bikes. What’s more, there are major mobility improvements underway to improve connections between Schiphol Airport, Amsterdam and Almere.

The Zuidas district, the business district of Amsterdam, is also growing, helped by its convenient proximity to Schiphol Airport, which is just six minutes away by train. The highways and the train stations are undergoing major reconstruction, including tunneling initiatives to improve and expand public space and to increase the capacity of the train station. The major companies located in this district are engaged in improving mobility by agreeing to commit to electric cabs, and are working together to develop Mobility as a Service for their employees.

As a part of the Smart City approach, Amsterdam has drafted a Smart mobility action plan. Within the plan, initiatives such as smart cycling, smart parking, Mobility as a Service with real-time traffic data, advice for best travel and ridesharing options.
Sitting in the bottom quartile of the Sustainable Cities Mobility Index, Perth is a city in the middle of significant change. Grappling with the mining downturn and the rapidly evolving needs of a changing city, Perth is behind Australia’s other cities in terms of its sustainable mobility.

Perth performed poorly in the Planet sub-index, largely due to the mining hangover, and also performed worse than other major cities on the use of public transport infrastructure.

While Perth scored modestly on several key indicators, the city has several major infrastructure projects under development which will see it improve in future rankings. Projects such as Perth City Link and Metronet will increase both public and private mobility options around the city and surrounding areas.

Perth is also yet to see the benefits of the federal government’s City Deals, which will provide federal funding to support development of transport-connected housing and the creation of employment opportunities.

A city in significant transition, in terms of its identity, economy and infrastructure mix, Perth currently sits behind many of the world’s major cities for integrated and sustainable mobility; however, this is set to change. The ambition of the state government, commitment and vision from the federal government, as well as an evolving local economy, will help create a Perth that is not only far stronger from an economic standpoint but also has a far stronger and more sustainable mobility mix.

A city undergoing significant change

WHAT CAN PERTH LEARN FROM BIRMINGHAM?

BIRMINGHAM

From the original London-to-Birmingham railway, to the city’s canals, the world-famous Spaghetti Junction and Birmingham International Airport, transport has long shaped the identity of England’s second city.

Yet, with so much now changing for the better in Birmingham, the city’s transport network will once again need to be the core driver of its economic success. Global businesses are now moving operations into the city on a large scale and highly skilled workers are relocating to Birmingham, in pursuit of a better quality of life.

Where there is growth there is always risk. Traveling across the city at peak time highlights the problem of overcrowding and, in particular, road congestion. The New Street station is the busiest outside of London and travel times around the wider West Midlands region area can be a challenge.

Productivity in the West Midlands remains lower than it should be. Given the region’s position at the heart of the government’s new Industrial Strategy, much more needs to be done to reduce congestion and travel time.

That said, city leaders understand the issues at stake and investing in mobility is a key priority. As an example, the newly appointed West Midlands Mayor is involved in the conversion of the old Curzon Street station into Birmingham’s state-of-the-art high speed rail hub.
Canberra ranks in the middle of its Australian and global counterparts in the 2017 Sustainable Cities Mobility Index. Sitting inland from the country's south-east coast, Canberra is unusual in comparison to the sprawling metropolis of its neighbours' due to the fact it is an entirely planned city outside of any state, like that of Washington D.C. in the US.

Canberra performs exceptionally well in the Profit indicator. Sitting in the top quarter of the Profit ranking at 24, the city has some of the lowest commuting times globally as a result of efficient road networks, and comparatively affordable public transport when looked at against average incomes. A stable housing market, steady employment and rapid population growth in the 21st century have led to economic prosperity.

The city's People indicator ranking of 78 shows that Canberra, like it's fellow Australian cities, should make significant efforts to remain liveable, sustainably mobile, and both regionally and globally competitive. The city performs well for air pollution and provision of green space, but in terms of multi-modal transit it is behind other cities due to a lack of diversity of transport, such as bicycle and walking infrastructure, and electric vehicle incentives. Improving access to, and upkeep of, transport services, and boosting infrastructure within the city to encourage 'active' commuting, such as walking or cycling, should be the city's first steps towards a more sustainably mobile future.

Canberra is increasingly being seen as a more affordable, less-congested alternative to Sydney or Melbourne. With a potential influx of citizens looking for a more affordable quality of life, Canberra should continue to address the sustainability of its transport mix. The Light Rail Network being rolled out by Transport Canberra is a good example of how that's being addressed, but the growing, changing city, like it's Australian counterparts, will need to be much more proactive in chasing urban mobility.

WHAT CAN CANBERRA LEARN FROM EDINBURGH?

A political and education city with pressure on its transport system

Edinburgh is the United Kingdom's fastest growing city and the largest British financial center after London. Close alignment with the London financial markets means that the success of these two cities often goes hand-in-hand and air links between the cities are vital to Edinburgh and the wider Scottish economy.

Edinburgh attracts thousands of tourists from around the world and the quality of life, together with its attractive aesthetic and prestigious educational establishments has fueled popularity with inward investors and have made the city a leading hub for digital entrepreneurs. Edinburgh’s universities draw students and staff from around the world and good air links to international hub airports are vital to support the ongoing growth of these major institutions.

As with many European cities in recent years, Edinburgh’s growing population has placed increasing pressure on its transport network and Edinburgh was recently named amongst the most congested cities in the United Kingdom. Recognising this, a plan has been formulated to build a truly world class and integrated transport system, by updating aging infrastructure and extending the recently completed tram line. The roads connecting to the city will be improved with the opening of the Queensferry Crossing, along with recent improvements to the M8 to Glasgow and planned reconstruction of the A9 to improve journeys north to the Highlands.

To improve quality of life in the city center, active travel must be encouraged and the city’s stretched transport infrastructure upgraded to better connect people to jobs and opportunities. The planned tram extension will improve links to the east of the city and seek to work in harmony with the growing cycling community.
HONG KONG

Hong Kong, first in the Index and the People sub-index, has long been famous for its world-class infrastructure. But as one of the planet’s most densely populated cities, it faces unique challenges in providing an efficient transportation system to meet the needs of its 7.3 million people. Challenges include limited space, a growing and aging population, rapidly increasing cross-boundary traffic with China and environmental concerns.

Hong Kong International Airport (HKIA) is one of the world’s best and busiest, with 70.5 million passengers in 2016. HKIA is operating at 99 percent capacity, with a third runway currently undergoing construction and due to open in 2024. The expansion of the airport is intended to aid Hong Kong’s role in connecting mainland China with the rest of the world, a key part of the Belt and Road Initiative, Beijing’s global trade development strategy.

The controversial Hong Kong-Zhuhai-Macau Bridge is scheduled to open at the end of 2017. The bridge, beset by delays and environmental concerns, is meant to bring closer economic integration between Hong Kong and the Pearl River Delta. There is no rail on the bridge, leading to concerns among some politicians and civil society groups that the number of vehicles coming from China will compromise Hong Kong’s drive for better air quality.

Hong Kong’s public transportation system oversees approximately 12.6 million passenger journeys every day and the Mass Transit Railway is recognized as one of the most efficient in the world. Public transport is relatively cheap compared to other world cities. Less than one fifth of people in Hong Kong own a car, but pedestrianized areas are few in number. Compared to European cities, commuting by bicycle is rare. This is partly due to Hong Kong’s climate and topography, but the city has done little to encourage the uptake of cycling.

SHANGHAI

Shanghai’s population has nearly doubled since 2000 to 24 million. As this rapid urbanization is showing no signs of slowing, the government is focused on a model of sustainability that accounts for the problems of limited land and public resources. Shanghai Urban Master Plan (2016-2040) takes these limitations into consideration while planning for the transformation of Shanghai into a global city.

Urban regeneration and innovation hubs will be crucial elements in transforming Shanghai from a manufacturing center into one of the most sustainable cities in China. Urban mobility will be key to this transformation, and Shanghai will be looking to further improve its transportation system. Fourteen of the city’s 25 metro lines are operational, making it one of the most comprehensive in the world. New lines are being built, although they must be dug as deep as a 15-story building to squeeze under the dense maze of existing tunnels.

While the metro seems in good health, the city’s bus system remains ripe for regeneration. Plans for a new major railway station are underway near Pudong International Airport. Shanghai East Railway Station is set to be the city’s fourth major railway station hub and will provide a direct link to the new Disneyland Resort, drawing additional tourism and traffic to the area. Construction is scheduled for late 2017 and is expected to be completed by 2022.

The city has a staggering 450,000 shared bicycles that are unlocked using GPS-enabled mobile apps. The bikes can be picked up and left anywhere, making them very convenient for users; although illegal parking is fast becoming a major issue for the authorities. The region continues to evolve its transportation connectivity to the greater Yangtze River Delta, with new high-speed rail and urban highway connections underway.
PARIS
Paris, third in the Index, has a strong transportation network and commitment to sustainability. This score comes from a balanced performance on the three dimensions of People, Profit and Planet, placing it in the top 20 of all three pillars. This is the outcome of a longstanding policy promoting public transportation, together with recent measures designed to aggressively develop cycling infrastructure and make the city more pedestrian-friendly. Paris was one of the first cities in the world to have a bike-sharing program and to convert a highway to a place for walking and exercise.

Paris intends to continue with its commitments to mobility. At the heart of this commitment is the major investment in the Grand Paris Express rapid metro, a system of four new state-of-the-art lines that will extend the dense and highly-interconnected network in the urban region. When completed, it is expected to carry two million people a day and will transform the lives of many Parisians. Although currently 56th in the Index for commuting time, it is expected that projects such as the Grand Paris Express will be instrumental in reducing the time Parisians spend getting to and from work every day.

Other major projects include the extension of the tram line that surrounds Paris and new rapid bus services in dedicated lanes. The city is also undertaking measures to resolve the persistent problem of air quality in the city center and to limit surface parking. Taken together, these developments suggest a mobility model in Paris that is increasingly diverse, accessible and inclusive, economically durable and environmentally sustainable.

ZURICH
Zurich is the largest city in Switzerland, providing a home to 415,000 people, significantly more than the official capital Bern. The number of residents is exceeded by the number of people working in Zurich (450,000) and by the population of the metropolitan region Zurich (over one million). One in eleven jobs is located in the Helvetian city, which presents challenges to the city’s transportation network as people need to get to work from within and outside the city borders.

To meet these challenges, in 2012 Zurich’s local government devised the Strategien Zurich 2025, which provides a framework for long-term sustainable development, including an overarching mobility plan. Although Zurich is well-connected through widely branched and modern public transportation, the use of private cars creates significant traffic stress.

The city’s mobility strategy centers on the expansion of the public transportation network and improving its upkeep and access. While trams, buses, city trains, and even ships and cableways already form a tight and efficient public transportation network, there is still room for further development. More tram and train lines are planned, and the entire network of the Zürcher Verkehrsbetriebe will be expanded with the construction of additional lines. Other measures designed to improve the environmental sustainability of the system include replacing diesel buses with trolleybuses and supporting car-less households.

In this light, developing the cycle network is an essential task. More cycle parking areas are being created, complemented by new guidance systems and efforts to reduce traffic dangers to cyclists.

A visionary part of the mobility strategy is the project Cargo sous terrain. A subterranean logistics network will transport goods between Swiss economic centers via a network of tunnels. Reloading hubs in the cities will ensure distribution of the goods by autonomous vehicles.
CHICAGO

January 2017 marked a significant milestone for Chicago’s infrastructure. The first phase of Chicago Transit Authority’s (CTA) Red and Purple Modernization Program (RPM) for commuter rail received a $1.1 billion federal grant to modernize a 100-year old transit corridor. This is the largest capital improvement program in CTA’s history and the modernization will enable quicker transport to accommodate the 40 percent increase in demand over the past five years and reduce overcrowding.

RPM is part of Mayor Emanuel’s Red Ahead program, an initiative focused on improvements to the city’s busiest elevated (“L”) rail line that services more than 240,000 riders during the work-week. The Wilson Station Reconstruction project is also part of the program designed to revitalize Uptown and improve the transferring experience for commuters. Another key hub, Union Station, is undergoing renovations to improve safety and to accommodate higher passenger volumes. There are also master plans for the station’s surroundings, including office, residential, hotel and retail spaces. In addition, necessary runway and construction improvements were also funded this year for O’Hare International Airport, the third busiest in the United States.

Like many cities, Chicago is looking to technology to improve efficiency and traveler experience. Chicago Transit Authority has implemented digital displays, upgraded security systems and installed 4G wireless services throughout its 22-mile underground subway stations and tunnels, making Chicago the largest North American city to provide this amenity.

With the recent federal support and private investment boom, Chicago will make great strides toward an improved mobility network over the coming years, enhancing connectivity and improving the quality of life of its residents.

LOS ANGELES

Traffic congestion is one of the biggest day-to-day challenges for Los Angeles’s residents, with the average person spending 104 hours stuck in traffic each year. The city is forecast to add an additional 500,000 residents over the next two decades, adding stress to roads and highways. In 2016, the city reached a critical milestone, when voters approved Measure M, an LA county-wide sales tax ballot that will fund much-needed infrastructure improvements.

Such funding includes projects like the Los Angeles Metropolitan Transit Authority’s (Metro) Active Transportation Rail-to-River Corridor, which aims to transform 10.6 miles of an underutilized rail area into a safe pedestrian and bicycle passageway. Metro is continuing its transit efforts with Regional Connector, a 1.9-mile alignment between two key stations downtown, as well as the Purple Line Extension, a nine-mile high-speed rail network that provides an alternative to congested roadways.

Digital technology offers opportunities; Metro recently announced a revamping of its fare payment system, TAP, to include app development, so commuters can easily reload funds through smartphones. E-signs, such as bus signage and wayfinding alerts, are also being implemented throughout the city, with the aim of streamlining trip experience and encouraging transit ridership. The Ports of Long Beach and Los Angeles have incorporated automation technology into their terminals to process container shipments faster, while minimizing safety risks and lessening the environmental impact of emissions and greenhouse gases.

Los Angeles is a pioneer in the use of electric vehicles. Its initiatives include providing 1,300 charging stations, designing the nation’s first EV car share program for low-income residents, and creating the nation’s largest EV police force fleet, demonstrating the city’s commitment to sustainability.
London is a city of transportation firsts: the world’s first underground railway network; the world’s first under-river tunnel; the world’s first international airport and the world’s first fully orbital ring road. London can be proud of its tradition of pioneering transportation and mobility infrastructure. Yet if the city is to be as transformed by the digital revolution in the 21st century as it was by the industrial revolution in the 19th, it must invest, adapt and, above all, innovate.

To have an edge on the competition, London must enable millions of people to travel daily in, out and around the city. It must create a high capacity, reliable, low cost and integrated transport network, all without disrupting day-to-day travel.

The network must be conducive to growth and receptive to rapidly emergent technology and it must support the increasingly polycentric nature of the city. Many of the developments necessary to achieve these goals are underway: HS2 with stations in Euston and Old Oak Common will increase capacity, drive regeneration and create new quarters in the city. Thames river crossings will increase connectivity and enable freer traffic flow; Crossrail will connect new areas of the city currently blighted by their isolation; and increased capacity at all five of London’s airports will maintain the city’s status as a global hub.

The question is, will London be reactive or boldly proactive? The long-awaited London plan must set a clear, far-sighted and integrated strategy. It needs to underwrite a vision for the future with a clear approach to mobility that catapults London into the 21st century and ensures economic productivity and sustainability.

Edinburgh attracts thousands of tourists from around the world and the quality of life, together with its attractive aesthetic and prestigious educational establishments has fueled popularity with inward investors and made the city a leading hub for digital entrepreneurs. Edinburgh’s universities draw students and staff from around the world and good air links to international hub airports are vital to support the ongoing growth of these major institutions.

As with many European cities in recent years, Edinburgh’s growing population has placed increasing pressure on its transport network and Edinburgh was recently named amongst the most congested cities in the United Kingdom. Recognizing this, a plan has been formulated to build a truly world class and integrated transport system, by updating aging infrastructure and extending the recently completed tram line. The roads connecting to the city will be improved with the opening of the Queensferry Crossing, along with recent improvements to the M8 to Glasgow and planned reconstruction of the A9 to improve journeys north to the Highlands.

To improve quality of life in the city center, active travel must be encouraged and the city’s stretched transport infrastructure upgraded to better connect people to jobs and opportunities. The planned tram extension will improve links to the east of the city and seek to work in harmony with the growing cycling community.
Manchester sits within the Northern Economic Region of the UK, an area of 16 million people, generating almost 20 percent of the UK’s economic output. It is a major strategic location for transport and distribution, with seven international airports and 12 major ports. With regional devolution and the newly appointed Metro Mayor, a great deal is expected of the region, with Manchester at its heart. As things stand, the area still lags behind the UK economy in terms of productivity, and transport links into and around the city are a source of much frustration for those living and working locally. It is for precisely these reasons that Manchester, along with the wider Northern Powerhouse, have set in motion plans to invest significantly in transport which it is hoped will contribute to a 30 percent increase in economic growth by 2050.

A key part of this strategy is the formation of the very first sub-national transport body, Transport for the North (TfN) in Manchester. TfN will have the power to make the strategic transport investment across the region and ensure the North realizes its considerable potential. Enhancing transit capacity, joining up the various networks across the metro area, upgrading main lines and introducing state-of-the-art smart travel programs for more efficient travel, are all key considerations. Investing in smart ticketing and integrated travel across major road networks, rail links, ports and airports will also see passengers able to get to work and affordability of the public transport network, as well as the city’s mobility system, including metrics for commuters, such as time taken to travel, mode share, and mode split.

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<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>UNIT</th>
<th>SOURCE</th>
<th>DATA LEVEL</th>
<th>FURTHER EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatalities</td>
<td>Traffic fatalities per 100,000 inhabitants</td>
<td>National Safety Council, Eurostat, WHO, various</td>
<td>Mostly city level (exceptions include China and Australia)</td>
<td>Traffic safety is of utmost importance and fatalities can be indicative of an under-served or under-maintained system.</td>
</tr>
<tr>
<td>Access to Transport Services</td>
<td>Bus and metro stops per km2</td>
<td>European Metropolitan Transport Authorities (EMTA), EPOMM, various</td>
<td>City</td>
<td>Accessibility of transport services heavily impacts how utilized they are by the residents of a city.</td>
</tr>
<tr>
<td>Modal Split of Trips Taken</td>
<td>Share of total trips taken by public transport</td>
<td>European Metropolitan Transport Authorities (EMTA), various</td>
<td>City</td>
<td>A higher number of trips taken by public transport recognizes utilization. The higher the utilization, the better.</td>
</tr>
<tr>
<td>Rider Connectivity</td>
<td>Wi-Fi in metro tunnels, stations and on buses, 2g/3g/4g in metro stations and tunnels</td>
<td>Various including local transport provider websites and news publications</td>
<td>City</td>
<td>Wi-Fi and 2/3/4g service within the transport system makes travel easier as well as more enjoyable and productive by allowing residents to use devices seamlessly during their journey.</td>
</tr>
<tr>
<td>Upkeep of the Metro System</td>
<td>Year of last major improvement; defined by track expansion or station additions</td>
<td>Various including local transport provider websites and news publications</td>
<td>City</td>
<td>Track and station additions assist in making use of the metro system easier for residents.</td>
</tr>
<tr>
<td>Wheelchair Access</td>
<td>Share of buses and metro stations that are wheelchair accessible</td>
<td>Various including local transport provider websites and news publications</td>
<td>City</td>
<td>Transport accessible to all boosts quality of life for residents.</td>
</tr>
<tr>
<td>Uptake of Active Commuting</td>
<td>Share of commuters cycling or walking to work</td>
<td>EMTA, EPOMM, Various</td>
<td>City</td>
<td>The ability to cycle or walk to work is reflected in the number that choose to do so each day. Active commuting has many benefits to residents.</td>
</tr>
<tr>
<td>Transport Applications and Digital Capabilities</td>
<td>Availability of transport system on Google Maps, an app created by the transportation authority, and existence of digital ticketing systems</td>
<td>Various including the Observatory of Automated Metros</td>
<td>City</td>
<td>Incorporation of digital capabilities into a transport system makes using public transport easier in cities.</td>
</tr>
<tr>
<td>Airport Passengers</td>
<td>Annual passenger traffic</td>
<td>ACI Airport Statistics</td>
<td>City</td>
<td>Airport traffic reflects the ability to get in and out of a city via plane.</td>
</tr>
<tr>
<td>Hours of Metro Accessibility</td>
<td>How many days a week the metro operates 24 hours</td>
<td>Various including information pages of local transport providers</td>
<td>City</td>
<td>24-hour accessibility in metro systems allows for greater use and flexibility for people. Cities without a metro system are penalized here, as metro systems are quick, easy and efficient. Often, the most sustainable form of public transport currently available to cities.</td>
</tr>
<tr>
<td>Transport Greenhouse Gas Emissions</td>
<td>Metric tons of CO2 per capita multiplied by CO2 from Transport</td>
<td>CDP Cities</td>
<td>City (Metric tons of CO2 per capita) x National (CO2 from transport)</td>
<td>This includes city data on all sources of emissions adjusted with national data on share of emissions resulting from transport.</td>
</tr>
<tr>
<td>Provision of Green Space</td>
<td>Green space as share of city area</td>
<td>Siemens Green City Index, World Cities Culture Forum, European Environment Agency</td>
<td>City</td>
<td>Greater use of public transit relieves the need for roads and parking, which can subsequently be turned into green space. Green space also helps counter the emissions from transport.</td>
</tr>
<tr>
<td>Congestion and Delays</td>
<td>Increase in overall travel time</td>
<td>TomTom, Numbeo</td>
<td>City</td>
<td>This measures the average increase in travel time from a free-flow situation to peak hours. Greater congestion leads to greater emissions and pollution.</td>
</tr>
<tr>
<td>Bicycle Infrastructure</td>
<td>Bicycles per capita and bicycle sharing schemes</td>
<td>MetroBike</td>
<td>City (sharing schemes) National (bike ownership)</td>
<td>Bicycle sharing schemes and ownership help alleviate road traffic and congestion.</td>
</tr>
<tr>
<td>Air Pollution</td>
<td>PM10 levels (µg/m3) / PM2.5 levels – simple average</td>
<td>WHO Global Urban Ambient Air Pollution Database</td>
<td>City</td>
<td>This includes all sources of pollution. Transport does account for a critical share of pollution.</td>
</tr>
<tr>
<td>Efforts to Lower Transport Emissions</td>
<td>Existence of LEZs and their prevalence (Cbr score) and vehicle emission standards</td>
<td>Various including European Commission’s Urban Access Regulations website</td>
<td>City</td>
<td>Low emission zones impact pollution as do high emission standards. This is a critical part of city and national policy to ensure environmental sustainability.</td>
</tr>
<tr>
<td>Electric Vehicle Incentives</td>
<td>Provision of incentives to produce/purchase EVs</td>
<td>Various including government transport department websites</td>
<td>City</td>
<td>Encouraging residents to switch to Electric Vehicles is an essential step in ensuring a lower emissions future.</td>
</tr>
<tr>
<td>Commuting Travel Time</td>
<td>Average commuting time</td>
<td>Numbeo Traffic Index</td>
<td>City</td>
<td>Additional time spent commuting is less time to contribute to economic activity.</td>
</tr>
<tr>
<td>Economic Opportunity</td>
<td>Transport system revenues as a share of expenses</td>
<td>Various including annual reports of transport providers</td>
<td>City</td>
<td>A city’s ability to fund transport system needs through revenue is critical to its sustainability.</td>
</tr>
<tr>
<td>Public Finance</td>
<td>Share of city budget spent on transport</td>
<td>Eurostat, city budgets</td>
<td>City</td>
<td>Many transit system upgrades are financed through multiple sources of funding, private, federal, state and city budgets. City budgets should still contribute to infrastructure needs and is indicative of its commitment to sustainable mobility.</td>
</tr>
<tr>
<td>Efficient of Road Networks</td>
<td>Max city speed limit</td>
<td>AA, Auto Europe</td>
<td>City</td>
<td>The more efficient the road network, the higher the speed limit can be set. There was no correlation between this indicator and the fatalities indicator in the People pillar.</td>
</tr>
<tr>
<td>Affordability of Public Transport</td>
<td>Transport spending as a percentage of income</td>
<td>Numbeo, Expatlistan</td>
<td>City</td>
<td>Refers to price of regular monthly pass for public transport as a proportion of average monthly net earnings in city. Affordability is a key factor in resident’s usage.</td>
</tr>
<tr>
<td>Utilization of the Transport System</td>
<td>Average number of public transport journeys per capita</td>
<td>Land Transport Authority Singapore, American Public Transport Association, various</td>
<td>City</td>
<td>A higher number of trips taken by transport recognizes utilization per capita. Higher usage also allows greater revenue capture from fares for a city.</td>
</tr>
</tbody>
</table>
### Table 2: Weightings and Rationale

<table>
<thead>
<tr>
<th>People Indicator and Weighting</th>
<th>Planet Indicator and Weighting</th>
<th>Profit Indicator and Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highest Weighting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modal split of trips taken - 16%</td>
<td>We want to encourage public transport use and this is the most direct measure of that.</td>
<td>Utilization of the transport system - 10%</td>
</tr>
<tr>
<td>Fatalities - 15%</td>
<td>Safety is a key feature of a good transport system.</td>
<td>Very important that the system is commonly used as top indicator.</td>
</tr>
<tr>
<td>Efforts to lower emissions - 16%</td>
<td>Efforts to lower transport emissions.</td>
<td>Measure city’s financial commitment which is critical even when considering alternative funding schemes.</td>
</tr>
<tr>
<td>Uptake of active digital capabilities - 13%</td>
<td>Uptake of active digital capabilities and transport system.</td>
<td>Greatly impacts daily life and utilization and popularity of the system.</td>
</tr>
<tr>
<td>Access to transport services - 19%</td>
<td>Access to transport services.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Uptake of active commuting - 12%</td>
<td>Importance of active commuting.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Transport applications and digital capabilities - 11%</td>
<td>Transport applications and digital capabilities.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Rider connectivity - 9%</td>
<td>Rider connectivity.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Uptake of the transport system - 8%</td>
<td>Uptake of the transport system.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Airports passengers - 7%</td>
<td>Airports passengers.</td>
<td>Greatly impacts daily life in the city.</td>
</tr>
<tr>
<td>Wheelchair access - 5%</td>
<td>Wheelchair access.</td>
<td>Greatly impacts daily life in the city.</td>
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<td>Hours of Metro Accessibility - 4%</td>
<td>Hours of Metro Accessibility.</td>
<td>Greatly impacts daily life in the city.</td>
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<td><strong>Lowest Weighting</strong></td>
<td></td>
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<tr>
<td>Provision of green space.</td>
<td>Transport applications and digital capabilities.</td>
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</tr>
<tr>
<td>Important in counteracting negative impacts but not as transport-specific.</td>
<td>Transport applications and digital capabilities.</td>
<td>Greatly impacts daily life in the city.</td>
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<td>Important measure, but not as transport-specific.</td>
<td>Transport applications and digital capabilities.</td>
<td>Greatly impacts daily life in the city.</td>
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