

A TALE OF OUR CITIES

2018 WSP GLOBAL INDEX

Can we design a place where our friends, families and neighbours can thrive?

What if we can?

FUTURE QUESTIONS

Can we help societies thrive
in a world we do not control?

Can we anticipate the unforeseeable,
perceive the unexplainable, and plan
something unbelievable?

Can we design the unthinkable?

Can we think international
and still act local?

Nurture sustainable societies,
connect communities
and seize opportunities?

Can we trace horizons,
hold true to our ambitions,
and hold ourselves accountable?

Can we design a place,
where our friends, families
and neighbours, can thrive?

What if we can?



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FOREWORD

As we enter an age when humanity's impacts become dominant in shaping our world – cities provide the biggest opportunity to enhance people's lives – and the biggest challenge. Cities are the canvas on which much of our collective futures will be drawn.

How cities are planned, designed, serviced, governed and financed is material to our happiness and prosperity, and the health of our society, and the natural systems on which all life depends.

While most attention is focused on the comparison of cities today – how livable, competitive or resilient they are – we have turned our lens to the future and explored how cities are identifying and responding to the challenges they will face in the coming two decades, and beyond.

A Tale of Our Cities – 2018 WSP Global Cities Index provides insights about how cities are preparing for a future shaped by the major urban transitions of our day: urbanization; density and growth; digital disruption; emerging mobility; evolving utilities models and a changing climate.

We have drawn on some of our 43,600 engineers, planners, scientists and consultants to undertake a qualitative assessment of strategic land use, infrastructure and technology planning frameworks and benchmark the results, for our cities around world. The assessments have been completed by WSP professionals that live and work in the respective cities.

Our research is intended to help government decision and policy-makers, captains of industry, financiers, academia and other professionals be future-focused and challenge the status quo, by leveraging the best-practice policies and initiatives that are being deployed around the world.

We look forward to being your partner on the journey to creating equitable, resilient and connected cities, where families and friends can thrive.

ALEXANDRE L'HEUREUX
President and CEO

INSIGHTS

PLANNING

In 1947, only two years after World War II ended and Denmark had been liberated, the Copenhagen Finger Plan was adopted to set the future direction for the Danish capital. The palm of a hand represented central Copenhagen and the five fingers were the areas of growth. This included an emphasis on green space across the metropolis consisting of recreational facilities (including sports grounds), forests, grassland and agricultural land.

More than 60 years later, the benefits a city can derive from long-term planning are evident, especially when it comes to placemaking. Today, Copenhagen is a leading city when evaluated on the metrics of Public Realm, Urban Green Space, Social Infrastructure, and Pedestrians and Cycling, and for these reasons it is considered as one of the most livable cities in the world.

What is clear is that the long-term vision from mid-century planners has left a truly extraordinary city, catering to the modern needs of its residents in ways those planners could barely have dreamt. The underpinnings of today's most competitive cities were laid in decades' past, by visionaries able to see beyond their immediate horizons.

What this suggests is that visionary planning can prepare a city for success, even in the face of extreme uncertainty and change. It plays a critical role in good amenity, services, and economic infrastructure and risk management. As with all plans, the political will, administrative capability and most importantly, financing, are necessary to implement them. At the very least good plans, with clear goals and pathways to fulfil them, give cities a yardstick by which they can measure their progress.

What follows is a snapshot of some of the cities' strategic planning, those that focus on the long-term, short-term, or a mixture of both and what their priorities are.

City Shaping Priorities



From the research that was undertaken, the issues that demand cities' attention the most are housing, both the cost and availability, followed by public transport.

Climate change, is also growing in importance. Even among cities where planning for climate change is not a leading priority, most have a blueprint to reduce their Greenhouse Gas (GHG) emissions. With a few exceptions, all have set a target, ranging from the extremely ambitious to the conservative.

Government Alignment and Financing

WSP's research reveals cities are acutely aware of the issues that impact on their livability, both now and into the future. On their journey of change, sometimes cities are challenged to fulfil their plans as they try to obtain political support and alignment from various tiers of government. Also, in the cities where residents can vote, change must often negotiate community sentiment.

Financing projects is another critical part of city development and innovative solutions are being embraced. Less than a mile southwest of New York City's Times Square on the Hudson River, millions of square feet of office, residential, and commercial space is being developed – one of the largest private real estate projects in American history. It's being underpinned by the principle that regulatory change or infrastructure investment can generate large increases in the land value. Also, benefiting the project was the first addition to the city's subway in 26 years, extending the line to the new 34th Street–Hudson Yards Station. Innovative financing for projects like these see that much of the up-front capital to pay for the public investments can come from bonds, which are repaid through revenues tied to the increase in land value and other sources.

Similar funding models are being explored by most global cities including London, where a new Property Sales Levy is being actively promoted.



Long-Term Thinking



Cities with long-term strategic plans include Auckland, Seoul, Sydney, Melbourne, Stockholm and London. In Auckland, forecasts to a little beyond 2040 suggest it will be home to more than one third of the country's population. The city planning authority believes it will cope with this growth and is committed to making Auckland a special place that is renowned for its lifestyle and environment. It has a plan to dovetail with this ambition, the Auckland Plan 2050, which has four key directions including providing public space and places that are "inclusive, accessible and contribute to urban living" and improving housing availability. On climate change, Auckland wants to reduce emissions by 40 per cent by 2040 and has devised a Low Carbon Strategic Action Plan to achieve this.

Housing and Public Transit are Top of Mind

For several cities in the United Kingdom (UK), housing and public transport dominate their long-term thinking. The New London Plan (drafted in December 2017), estimates the likely population growth to 2041 and maps out a strategic housing target of 65,000 homes a year by then (increased from 49,000 in the adopted London Plan). With London boasting some of the most expensive real estate in the world, the plan includes a target for half of all new homes to be "genuinely affordable".

The same plan also has a green space strategy, as well as education and childcare facilities.

Manchester is also prioritising housing, with a 15-year strategy to build 227,000 new homes in the city, 20 per cent of them "affordable". For Edinburgh, there is a strong focus on transport that is laid out in its Transport 2030 Vision. By 2030 and if funding is secured, Edinburgh could have one of the greenest, healthiest and most accessible public transport systems in northern Europe.

While there is a notable difference between Organization for Economic Cooperation (OECD) cities and emerging cities, they share similar housing challenges. Delhi with its Delhi Master Plan 2021 has a vision of being a world-class city and will need to build a staggering 2.4 million new homes by 2021 to accommodate the projected population growth.

New York City has a plan to build and preserve 300,000 units of affordable housing between 2014 and 2026. During the past seven years, New York has delivered 15,000 new housing units annually, on average, while the population has grown by more than 60,000 a year. The outcome signals what many cities are experiencing; demand is outstripping supply.

The Swedish capital, Stockholm, is home to 2.4 million people and is expected to grow to 3.2 million by 2035. The city takes a long-term view with its Regional Development Plan for the Stockholm Region 2050, which was ratified in June 2018. Housing has become a social challenge with Stockholm regularly ranking among the most expensive cities in Europe.

Stockholm differs from some other cities that we assessed, in that its housing market is highly regulated as part of Sweden's national approach to this issue. Approximately 22 per cent of the city's housing is municipality-owned rental units, for which there are long queues due to affordability. Private rents are equally regulated and legally prohibited from being higher. The end-result is, buying is expensive because demand far exceeds supply.

On the rental front, they can be very high on the secondary market, which impacts most on young people, students, immigrants and people moving from other parts of Sweden.

To tackle the issue the city has set housing targets by region and district, in the current development plan, which estimates that 140,000 new homes will be built by 2030. The plan focuses on creating coherent urban growth, tying together districts as well as densifying inner-city areas.

Calgary is home to 1.2 million people and the third largest city in Canada. Much of its focus is on shorter-term planning. The City of Calgary's Action Plan (2015-2018) looks to increase affordable and accessible housing options: the Calgary Municipal Development Plan (2009) emphasizes sustainable local communities; the Foundation for Home is a corporate affordable housing strategy that identifies six objectives and actions from 2016 to 2025; while the Capital Budget 2019-2022 Action Plan recommends a variety of built forms. Various other plans focusing on public realm, include the Calgary Metropolitan Plan, the Complete Streets Guide, the Transit Friendly Design Guide, the Design Guidelines for Subdivision Servicing, Residential Street Design Policy and Street Capacity Guidelines and a section of the Transportation Plan which specifically drills down on designing multi-modal streets.

The Municipal Development Plan includes policies that emphasize pedestrian-friendly streetscape design and outlines design principles for sustainable streetscapes in the Streetscape Guide. It also presents policies that deal with creating connected plazas and squares. The Major Activity Centers section includes policies that deal with the creation of successful public plazas and "key gathering areas". The Rivers Community District Revitalization Plan was created in conjunction with an environmental remediation strategy and a flood protection initiative by the city.

In Australia, Sydney and Melbourne have long-term ambitions. Continued strong population growth is expected in Sydney, especially west of Parramatta, prompting the Greater Sydney Commission (GSC) to take a long-term view of metropolitan planning aligned with infrastructure planning to handle it. The draft regional plan for Greater Sydney has been concurrently developed with the metropolitan transport plan, Future Transport 2056, and the State Infrastructure Strategy. In addition, several strategic planning documents for the harbor city's future integrated transport system have been developed by state agencies and the GSC. Local councils have also added their strategic plans.

In Melbourne, the overarching planning document dealing with housing is Plan Melbourne 2017-2050. A key recommendation is for Melbourne to provide housing choices in locations close to jobs and services, which is challenging in a city that continues to grow east and west, with 50 new suburbs added since 2006 and with more to follow.

Seoul, which accommodates half of South Korea's population has had a strategic planning approach for the medium-term, since 1990. Since that year, the Seoul Metropolitan Government has issued periodic City Development Plans as the highest level of framework for the following 20 years. The fourth plan, issued in 2014 and looking out to 2030, has a broad framework covering social, economic, environment/energy, transportation/infrastructure, culture and welfare.

In Toronto, Metrolinx, an agency of the Government of Ontario was established, to improve the coordination and integration of all modes of transport in Greater Toronto and Hamilton, and it has been a resounding success. The first Regional Transportation Plan was developed in 2008 to develop a series of major transportation projects. Its success has resulted in Metrolinx publishing a vision for Toronto's transportation system for the next 25 years. On the other side of the continent, in Vancouver, the Regional Transportation Strategy has been extended to 2040. Vancouver has also established a mobility group to explore future transport options and update regional transport strategies.

Adapting to a Changing Climate

In emerging cities, such as Colombia's capital, Bogotá, they too are looking ahead with a District Development Plan, Bogotá Best For All. Getting the city council's seal of approval in 2016, it prioritizes physical and technological infrastructure in health, schooling and transport. On GHG emissions, it has prepared the District Plan for Risk Management and Climate Change for Bogotá 2015-2050. There is good intent in this bio-diverse rich city and hope to meet the needs of the swelling population.

Brisbane, has a plan, Brisbane. Clean, Green, Sustainable 2017-2031, with its goals to reduce GHG emissions statewide 30 per cent by 2030 and to zero by 2050. This is ambitious considering coal remains the primary energy source. Australia is on a winding path to new policy for energy, with the Federal and State governments seeking policy that will better control electricity pricing and ensure on-going stability of the system.

In Beijing, there are directives for industry to reduce emissions but no overall plan. Dubai aims to provide seven per cent of its energy through renewable sources by 2020 with increased targets to 2050.

Seattle, which heads our Index, has also set 2050 as the date to be carbon neutral, a goal common to all major West Coast cities. Its Climate Action Plan provides long-term planning direction and guidance for climate protection and adaptation efforts through to 2030. Adopted in June 2013, the plan focuses on city actions that reduce GHG emissions and support vibrant neighbourhoods, economic prosperity and social equity. Actions are focused on areas of greatest need and impact: transportation, building energy and waste.

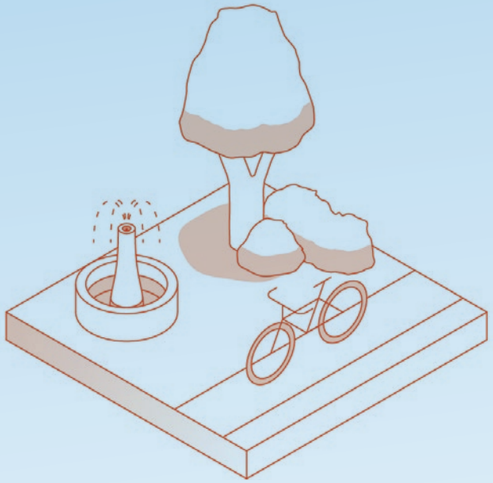
Planning Our Future Cities

Plans are critical. They not only give city administrations a blueprint for how they want their cities to develop, but they also provide citizens with an opportunity to better understand the issues their cities face and to have a voice about how to potentially resolve them. As demonstrated by Copenhagen and many of the other cities included in this research, having a clearly articulated vision with ambitious goals can result in world-class globally competitive cities that people are happy to call home, today and for future generations.

Moving forward, city authorities will need to adopt a community engagement approach that is bespoke to local needs if we are to create extraordinary places where our citizens want to live.



AMENITY



From the 24 metropolises included in our research, New York City leads the way with Amenity, the city performing well on most of the metrics. New York City's considerable investments in parks and public spaces, and increased street space for pedestrians and bicycles, are paying dividends for the city in making it far more liveable.

In addition, waterfront areas that were once devoted to port and industrial uses are finding new leases on life as parks and walkways. These include the Hudson and East River waterfronts, Governors Island and the Gateway National Park. The High Line Park, built on an unused elevated freight rail line, has established a new standard for innovation in park design. The massive Fresh Kills Landfill is becoming a park.

During the past 10 years, the city has planted more than one million trees in its parks, on its streets and on private land, increasing its urban forest area by more than 20 per cent. These trees provide several benefits, including improving air quality, reducing urban temperatures, and sequestering carbon dioxide, while also mitigating stormwater runoff.

New York city's 2010 Green Infrastructure Plan has resulted in the construction of more than 4,000 green infrastructure assets, including rain gardens (bio-swales) and green roofs, reducing stormwater runoff and combined sewer overflow events.

Pedestrians and Cycling

Cities Leading in Active Transport

STOCKHOLM
COPENHAGEN
SAN FRANCISCO
NEW YORK
EDINBURGH

Copenhagen also performs well in Amenity, particularly on Pedestrians and Cycling. Stockholm, San Francisco, New York City and Edinburgh are also standing tall on their commitments to foot and pedal power.

The Danish capital, Copenhagen is strongly committed to cyclists and pedestrians, having invested CAD200 million during the past decade, and since 2015, has commissioned the building of 16 bridges (half now opened) encouraging further adoption of walking or cycling in a city already leading on active transport.

So too, is Stockholm. Cycling is the active transport of choice for many Stockholmers, especially in spring and summer. The city has set itself the ambitious goal of increasing bicycle traffic from five per cent to 20 per cent by 2030, and has put in place a regional cycle plan that includes a review of what should be done and the estimated cost. Part of the plan is for 850 kilometers of dedicated bicycle paths to be built.

Public Realm and Urban Green Space

There are six others cities which perform well on half of the metrics for Amenity: Seattle, Stockholm, Toronto, Montreal, Vancouver and Singapore. The Southeast Asian giant, Singapore, continues to invest in amenities while other cities, specifically in Australia and Canada, rely more on natural amenities to carry them forward.

Vancouver, which sits on Canada's western seaboard just north of the USA border, shines by delivering good Public Realm. A well-designed and well-planned public realm plays an important role in shaping communities. In Vancouver, plazas, publicly accessible urban waterfronts and walkable streetscapes, enhance the city's livability and neighbourhood character, which in turn helps to attract and retain talent, and foster economic growth.

The city's streetscapes and vibrant public spaces are created using various frameworks and plans including, Streetscape Design Guidelines, Street Restoration Manual and the Complete Streets Policy Framework and Related By-Law Changes, as well as The Places for People Downtown Program, Plaza Stewardship Strategy and Transport 2040. Additionally, the Transit-Oriented Communities Design Guidelines were developed to improve placemaking around public transit in the Metro Vancouver area.

Vancouver's bustling waterfront is one of its greatest assets. In recent years, regional and local municipalities sought to consolidate economic goals with sustainability, resilience and residents' wellbeing ambitions. The Port Metro Vancouver Land Use Plan outlines a 20-year framework for the development of port lands that is designed to be responsive to business and market needs, while balancing those interests with the protection of the natural and physical environments. In March, the city released the State of the Waterfront Report which sets targets and performance indicators for different areas of focus in waterfront development: working, living, access to nature, ecosystems and transportation.

Equally as important to livability is Urban Green Space and from the cities included in this research, these lead by example: Stockholm, Toronto, Copenhagen, Brisbane and Calgary.

Two other notable observations about Public Realm and Urban Green Space are: cities from emerging economies need to leverage living space as a premium; and cities performing well on this metric are often surrounded by natural assets.



Parking Provisions

Montreal tops the list on the metric of Parking Provisions followed by Copenhagen. The parking policy that Montreal has developed aims to redefine dedicated space by considering the environmental impact of on-street and off-street parking (urban heat island), and the willingness of citizens to reduce their private vehicle dependency.

The policy features various innovations including, sustainable mobility poles, new pricing, public transport service harmonization, dedicated parking spaces for a bike-sharing service and real-time information system integration, to name a few.

In Copenhagen, motorists can pay for parking at one of the 1,600 solar-powered parking machines or by using a smartphone app that allows for additional time to be purchased. There are four color-coded parking zones in Copenhagen, decreasing in price per zone when moving away from the city center.

Copenhagen has also experimented with other smart-parking initiatives including multiuse parking spaces in busy areas where a street carpark is available only for cyclists to use between 7:00am to 5:00pm, and between 5:00pm to 7:00pm is available for car parking only. The city is also developing a smart parking app to help motorists find available parking spaces.

Water Treatment and Distribution



Cities Leading in Water Treatment & Distribution

NEW YORK
SEATTLE
BEIJING
SINGAPORE

Of the four cities that lead in Water Treatment and Distribution in this Index, two are in Asia – Beijing and Singapore – and two are in North America – New York City and Seattle.

New York City takes top position with a water supply system that is one of the most sophisticated in the world, supplying the city with almost four trillion liters of water daily from the Catskill Mountains, which is hundreds of kilometers away. There is heavy investment to preserve land in the watershed to ensure development does not impair water quality.

The Seattle water system supplies about 530 million liters of water a day to about 1.4 million people. The system relies on two big regional watersheds, the Cedar and Tolt, which are also home to wildlife and salmon. The 36,680-hectare Cedar Watershed, about 56 kilometers southeast of Seattle, supports a diverse ecosystem and provides about 70 per cent of the drinking water. The rest comes from the foothills of the Cascades in east King County.

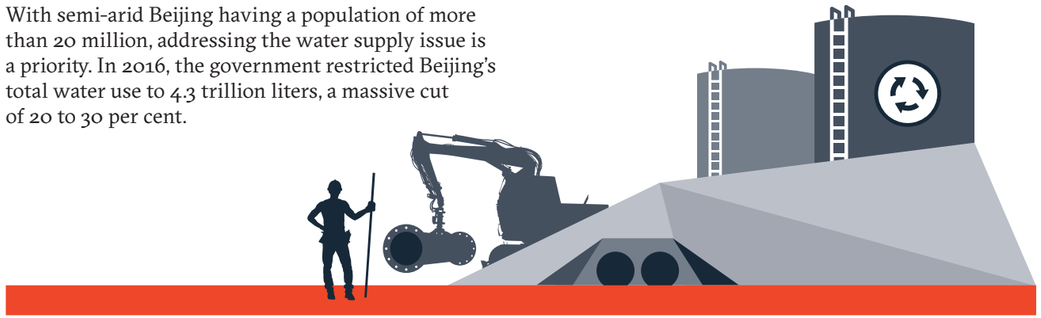
With semi-arid Beijing having a population of more than 20 million, addressing the water supply issue is a priority. In 2016, the government restricted Beijing's total water use to 4.3 trillion liters, a massive cut of 20 to 30 per cent.

On the supply side, the Beijing Municipal Government has embarked on a three-year action plan to accelerate the sewage treatment of a black river, and to discover potential sources of renewable water. Up to 1,081 kilometres of sewage pipeline will be built or replaced, 14 sewage treatment plants will be upgraded or relocated into parks, and 472 kilometres of recycled water pipeline and 27 recycled water treatment plants will be constructed. It's a significant policy achievement.

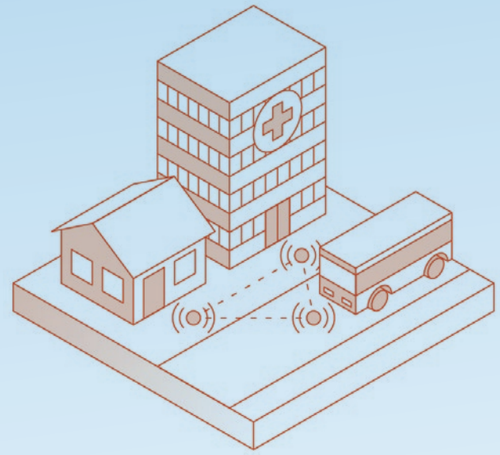
In Singapore, the water demand is about 1.63 billion liters a day, with homes consuming 45 per cent and the non-domestic sector taking the rest. By 2060, Singapore's total water demand could almost double, with the non-domestic sector accounting for about 70 per cent. By then, reclaimed water (NEWater) and desalination will meet up to 85 per cent of Singapore's demand.

The sewerage network collects used water from domestic and non-domestic (e.g. industrial or commercial) sources. Used water is channeled through a combination of gravity sewers and pumping stations to the water reclamation plants, where it is treated in accordance with international standards. Part of this treated used water, which is safe enough to be returned to nature, is sent to a separate treatment system in the NEWater plants. The remainder is discharged to the sea.

Driven by increasing water demand, rising operational costs, manpower constraints and new challenges such as climate change, the Public Utilities Board (PUB), the Singaporean Statutory Board of the Ministry of the Environment and Water Resources responsible for ensuring a sustainable and efficient water supply, are leveraging digital solutions and smart technologies to strengthen their operational resilience, productivity, safety and security. PUB is exploring two key innovations for remote water quality monitoring, the Remote Micro-Invertebrate Detector and the Autonomous Boat.



SERVICES



From the cities included in our research, Singapore outperforms other cities for Services, on most of the key metrics. San Francisco, Stockholm, Copenhagen, Seoul and Beijing also demonstrate leadership in the future provision of Services.

Housing



Cities Leading in Housing

SINGAPORE
COPENHAGEN
EDINBURGH
VANCOUVER

As highlighted in the Planning insights of this Index, much of the cities' focus is on public housing.

One city that achieves a lofty score for Housing is Singapore. The city state, which sits on the Equator, has made good and affordable housing a priority, with the Housing Development Board responsible for building affordable homes and transforming towns to create value and quality living. Singapore enjoys a well-organised government with a clear mandate for implementing improvements. This is noticeable in how they've delivered housing.

Singapore's aim, set out in the January 2013 Land Use Plan, is to build up to 700,000 new homes by 2030 to meet predicted population growth. Of these, almost 200,000 are already in the pipeline. Many of the remaining 500,000 homes will be in new towns and housing estates, infill sites in existing towns, land freed up by the redevelopment of old estates, and vacant land within and on the fringe of the city center. The speed of constructing new homes will depend on actual demand. Existing towns will be rejuvenated through government-funded development programs.

Copenhagen, Edinburgh and Vancouver, also have robust Housing programs in place.

The demand for housing in Copenhagen is rising as 200 people move to the city each week from other cities in Denmark and overseas. Copenhagen is a highly desirable city for property investment and development, and 25 per cent of all new real estate investments are foreign.

In 2013, the city began construction of an additional 2.5 million square meters of housing and three million square meters for business, as a pre-emptive measure to cope with the forecast population growth. At present, an average 61 per cent of household disposable income in Copenhagen is spent on housing. Only 20 per cent of housing units in the Danish capital are owner-occupied, and there is an even split of private rentals, cooperative housing and social housing.

Copenhagen Municipality has recently introduced a mandate that one quarter of all new housing developments must have an area allocated for affordable housing. Several nearby municipalities are also adopting this concept.

In Edinburgh, the housing strategy which was published this year, acknowledges the forecast long-term population increase (nearly 17 per cent by 2035) and pledges CAD5.2 billion towards housing development in the city. It includes a commitment to building 50,000 affordable houses by 2020.

Turning to Vancouver, the Metro Vancouver Regional District (Metro Vancouver), is a body governing an area that includes 21 municipalities, including the City of Vancouver, the most populous city within the regional boundaries. Metro Vancouver developed a Regional Affordable Housing Strategy which provides a list of recommended actions for municipal members and provincial and federal governments. Metro 2040 provides the overall growth management framework for the region and for the Regional Affordable Housing Strategy. It brings together regional land use and transportation planning, and directs growth to urban centers and Frequent Transit Development Areas (FTDAs).

The city also benefits from the Metro Vancouver Housing Corporation, a non-profit organization that provides affordable housing for low and middle-income households.

Public Transit



Cities Leading in Public Transit

SINGAPORE
BEIJING
SEOUL
COPENHAGEN
STOCKHOLM

Similar to Housing, Public Transit demands major capital expenditure, with cities often needing to convince federal/state/provincial governments and/or private investors of the merits of projects.

Of the cities included in our research, Singapore, Beijing, Seoul, Copenhagen and Stockholm perform well on the metric of Public Transit.

Cities that are highly livable emphasize walkability and tend to have extensive, affordable and high quality public transport that connects people to jobs, schools and amenities in an efficient and reliable way. In Singapore, travel needs are largely met by trains and buses.

The rail network in Singapore is the backbone of its public transport system. The Circle Line was opened in 2011 to connect people in the east, west and north without passing through the busy interchanges in the city center. The Downtown Line, opened in stages from 2013 to 2017, serves to improve connectivity for commuters in the northwest and east. The Thomson Line primarily serves the population in the north and will be opened in stages from next year to 2021. With the introduction of these lines, as well as the Eastern Region Line, Tuas West Extension and North-South Line Extension, the rail network will increase by about 100 kilometers to 280 kilometers by 2021.

By 2030, the rail network will further extend to include the Cross Island Line, Jurong Region Line, Circle Line Stage 6, North East Line extension and the Downtown Line extension.

Moving to bustling Beijing, the city's five-year plan includes the expansion of its subway transit network. Construction of four subway lines will begin this year and two railway lines will be completed.

Building of the S6 Line, which links Beijing with Baizhou, ZhangJiaKou, TangShan, BinHai and ShijiaZhuang is also a priority.

Beijing already has 12 transport hubs where passengers can change from subway to bus or vice versa. Three new hubs are being built at Science City, Wangjing West subway station and Tonzhou district, of which the latter will cover 70 hectares and be the biggest in China.

Since 2006, all transport modes have used a contactless ticketing systems and soon a new system will be implemented that will enable passengers to download a mobile app, which scans QR codes.

Seoul is in the process of preparing transport policies that focus on encouraging pedestrian, cycle and public transport through active traffic demand management and human-centered infrastructure supply (securing space for pedestrian, cycles and public transport).

The Seoul Metropolitan railway system is comprised of 22 regional, metro and light rail lines. At present, Metro 9 and the Shinbundang Line are being extended and the light rail Sillim Line is being built, and eight new light rail lines are planned.

Since the introduction of exclusive median bus lanes in the early 2000s, the system has expanded by about 15 kilometers a year, mainly on roads with heavy traffic congestion. Today, some 119 kilometers of exclusive median bus lanes operate, providing fast and safe bus services, and connecting major arterial. By 2026, the system will be extended to 214 kilometers of bus lanes.

Seoul also has plans to expand its metropolitan transfer centers and park-and-ride.

In 2017, the newly built Gyeonggang bullet train line linked Incheon Airport to the port city of Gangneung, crossed the north of the country from coast to coast and connected Seoul to Pyeongchang, the Winter Olympics venue. It is now possible to travel by train from Seoul to South Korea's other big cities in three hours.

In Copenhagen, commuting from the outskirts of the city and getting around the CBD has been made easier by a combination of public transport and cycling. Citizens also benefit from a national regulation which mandated for all new office buildings to be located within 600 meters from a railway station.

A second metro route with 17 stations is due to open in 2019 and further extensions are also underway. Looking ahead to 2024, a 28-kilometer light rail line in northern Copenhagen will connect six local train lines and numerous bus routes.

All trains, metros and ferries in Copenhagen allow cyclists to take their bicycles along for the ride. It is free to take your bicycle on the train and there are at least two dedicated carriages fitted with parking rakes for bikes.

Moving across the Nordics to Stockholm, the city is in an exciting development phase in which many parts of the infrastructure system are being rebuilt, including expanding the subway system with 11 additional stations. Rail transport via the subway remains the backbone of Stockholm's urban infrastructure and explains why the city has a high patronage rate; about 70 per cent of all journeys occur during peak hours. Policy makers have also successfully implemented congestion charging in the city and on major thoroughfares.

The present long-term master plan (2014-25) calls for a focus on the development of regional infrastructure to improve connections to neighbouring regions. High-speed rail connecting Stockholm to Gothenburg and Malmö is being planned. Other capacity-increasing rail and infrastructure projects are under way, such as the Bypass Stockholm, which reroutes traffic from the major freeway passing through the city. By 2035, an estimated 140,000 vehicles a day will use the bypass.



Future Mobility Services



Cities Leading in Future Mobility Services

SAN FRANCISCO
SINGAPORE
BEIJING
LONDON
STOCKHOLM

Based on our assessment, the top five performers for Future Mobility Services are San Francisco, Singapore, Beijing, London and Stockholm.

San Francisco has many point-to-point services, including electric scooters, mopeds and bikes. There is a permit process in place and pilot programs allowing the city to examine the data collected by the service providers. Also, app-based on-demand services, as well as ride-share and car-share services, are everywhere, so much so that ride-share usership is potentially threatening public transport patronage. The widespread use of ride-share services combined with the car sharing services also reduces the need for car ownership.

In Singapore, 12 per cent of land is set aside for roads and transport infrastructure. With a growing population and more than one million vehicles on the road, the challenge lies in optimizing the use of limited space.

Beeline is a demand-driven, shared transit experiment by GovTech and the Land Transport Authority (LTA). It is an open, cloud-based smart mobility platform developed to provide data-driven shuttle bus services for commuters. The platform enables commuters to book a seat on buses that are provided by private operators. In March 2017, Grab, a private technology company offering ride-hailing transport services, launched a shuttle service in collaboration with GovSec. This new service, called Grab Shuttle, is powered by Beeline.

Through separate partnership agreements with the LTA, Delphi Automotive Systems and nuTonomy, trials are being undertaken for shared autonomous mobility on-demand concepts.

If the trials are successful, the projects will be developed into full-scale mobility solutions and Singaporeans will enjoy more comfort and convenience on their journeys, especially for first-and-last-mile and intra-city travel.

Beijing's private sector offers point to point, on-demand, ride-share and car-share services under policies decided by the government. Since 2016, the Beijing Traffic Commission has managed the internet booking of taxis. Last year, the Ministry of Transport, and the Ministry of Housing and Urban-Rural Development issued a joint guidance policy about the sustainable development of mini car rentals. In 2016, the popularity of bicycle sharing was in full swing, with the total number of bicycles reaching 2.35 million.

From the city that leads on this Index, Seattle, is at the cutting edge of the smart city era. It boasts a robust technology ecosystem that includes the University of Washington's eScience Institute Program and various data-driven companies like Microsoft, Socrata, INRIX and Zillow, working collaboratively on smart city initiatives, such as an adaptive traffic light system to help reduce congestion by detecting vehicles.

In London, trial smart bus routes have led to SmartRide, a point-to-point hybrid bus and taxi service. The potential of demand-responsive buses is also being investigated, with four routes currently being trialed. Uber already provides ride-share services and Daimler AG and Via will follow suit to provide ride-share shuttles in the city. Many car club companies operate in London and by 2025, the Car Club Coalition aims to have secured one million members through the implementation of the London Car Club Strategy.

Other good examples are from Sweden, as usage of cycle-sharing continues to grow in Stockholm. Car-sharing is another booming industry with several companies now operating in the city. As well as taking more cars off the roads, it is an inexpensive alternative for those who only want a car for single occasions. Point-to-point and on-demand services are also on the rise.

Mobility as a Service (MaaS) plays a role in many cities. It formalizes the shared mobility offer by commercializing it for either personal travel or the shipment of goods. A particular trip can take advantage of one or more of the above shared mobility options to produce a seamless journey experience. A wide range of on-demand services are on offer, across the range shown above, with the exact options dependent on location, origin and destination. Trips are usually planned and booked via digital apps and similar, with costs that are either pay-as-you-go or bundled.

MaaS models work best where there is already a wide range of transport modes, where data access is relatively open, where operators offer contactless sales or e-ticketing, and where they are open to third parties selling their services.

Future Mobility Technology

Four cities lead on the metric of Future Mobility Technology (Singapore, San Francisco, Stockholm and Beijing). In Singapore, the LTA has signed agreements with companies to develop solutions for autonomous truck platooning to transport containers from one port terminal to another, as well as having issued a request for information for the development of self-driving utility vehicles for waste collection and road sweeping.

Trials for autonomous mobility on-demand services were launched and these comprise a fleet of shared self-driving shuttles or pods that commuters will be able to book through their smartphones to bring them in air-conditioned comfort from their doorstep to the train station or other neighbourhood amenities. This provides for a more comfortable option for first-and-last-mile connectivity and brings greater mobility to the elderly and other commuters who may have difficulty in taking present day public transport. In addition, a 3.5-year project is underway to develop and trial autonomous buses with the possibility of being deployed to serve fixed and scheduled services for intra- and inter-city travel.

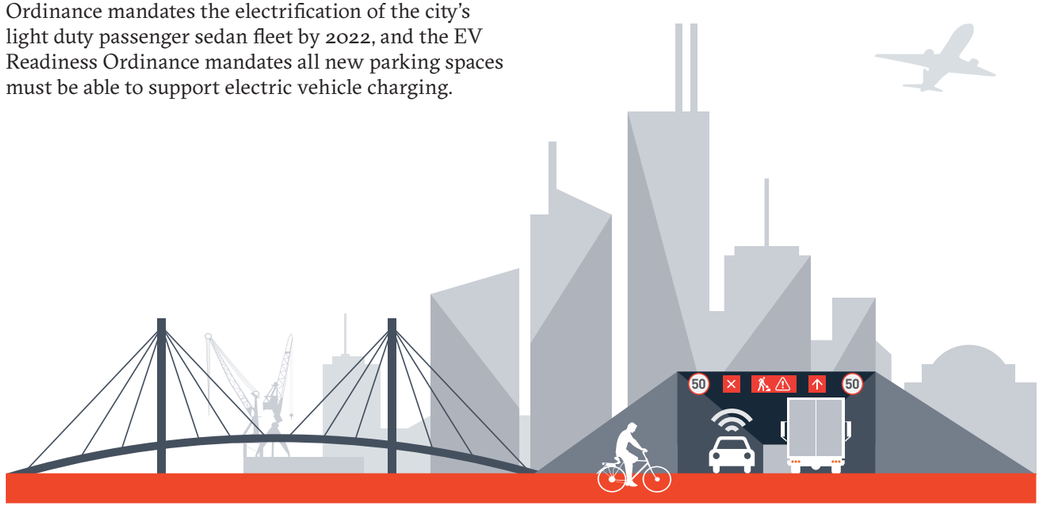
Stateside in San Francisco, policy and strategy surrounding connected and autonomous vehicles is set by the state. A trial of an autonomous shuttle is underway at Treasure Island, an artificial island in San Francisco Bay. The City Fleet Zero Emission Vehicle Ordinance mandates the electrification of the city's light duty passenger sedan fleet by 2022, and the EV Readiness Ordinance mandates all new parking spaces must be able to support electric vehicle charging.

The citywide Electric Mobility Strategy, which is focused on electrification of private vehicles, will lay out a vision for reducing adverse impacts of private transport and identify pilots, programs, policies and partnerships to help create a zero-emission transport sector.

In Stockholm, a project called, eRoad Arlanda, will be seen as a world leader in allowing electric vehicles to recharge as they drive. In addition, several moves have been made to promote electrification, among them the Vattenfall AB "inCharge" initiative in collaboration with several companies to make charging of electrical vehicles more available to the public.

The number of electric cars in Stockholm is increasing, as well as the charging infrastructure. The City Council has voted to execute a ban, expected to be implemented in 2020, on some fuels in inner-city areas to improve air quality. The major bus distributor of public transport in Stockholm is investigating the possibility of most of their fleet becoming electric. This could be in place by 2026, when the current traffic agreement will be renegotiated.

In 2017, the Beijing Government began implementing a policy that requires electric vehicle charging facilities every five kilometers. The minimum ratio of charging facilities to total parking spaces is 1:4 for new office buildings, 1:5 for commercial buildings and community car parks, 1:1 for residential development, and 3:20 for other public buildings such as hospitals, schools and cultural facilities. In March 2018, Beijing released its first road test license for driverless cars.



Technology Connectivity and Infrastructure

Moving into the technology sphere and the metric of Connectivity and Infrastructure, five cities performed very well including, Montreal, Seattle, Vancouver, Seoul and Calgary.

In 2016, Montreal was named Intelligent Community of the Year by the Intelligent Community Forum. It was recognized for its innovative use of information and communications technologies to create economic prosperity by addressing social issues and enhancing quality of life, in part by improving transportation and mobility. Montreal created the Smart and Digital City Office in 2014 and has initiated 70 projects through the 2015-2017 Montreal, Smart and Digital City Action Plan. Already recognized for its vitality in the field of digital technologies, the city aims to become a world leader among smart and digital cities.

In the mid-1990s, Seattle regularly studied and assessed the state of broadband services and infrastructure. In 1996, it installed 550 miles of fiber, although much of this cable remains unused, and some of it is leased to private companies. Seattle leverages several Public Private Partnerships (PPPs) with telecommunication providers including Xfinity, CenturyLink and Wave, to explore opportunities for improved internet access for citizens.

Due to the exclusive federal jurisdiction over wired and wireless telecommunications in Canada, Metro Vancouver has a limited role in influencing outcomes. However, the City of Surrey, which is a part of Metro Vancouver, has laid the groundwork to thrive in the new age of digital connectivity. By the end of this year, fiber infrastructure will bring broadband speeds to 90 per cent of businesses and homes in Surrey and connect the city to broadband networks eastward across Canada and southwards down the Cascadia Innovation Corridor, all the way to California. The City of Surrey is aiming to become a Metro Vancouver digital service hub.

Looking at Asia and specifically, Seoul, we see a leading player in smart industries and their infrastructure related to communications services is well-established. South Korea has 21 million high-speed internet connections and 64.3 million wireless communication service devices in the hands of subscribers. Considering it has a population of 51 million, the level of communications technology usage is healthy.

In Calgary, the city has progressively developed fiber network strategies to ensure essential digital connectivity and improved digital access to the city's services. Its Digital Strategy was developed to serve as a long-term plan for how it can leverage digital platforms to connect, communicate and engage with each other, with citizens and with other levels of government. A nonprofit technology agency, Cybera, has developed a Digital Infrastructure Report for the province of Alberta that provides a detailed review of Alberta's current network connectivity, data center resources, high-performance and cloud computing resources, cybersecurity awareness and protection measures, data management policies and procedures. The report also outlines an overall review of digital infrastructure in the province.

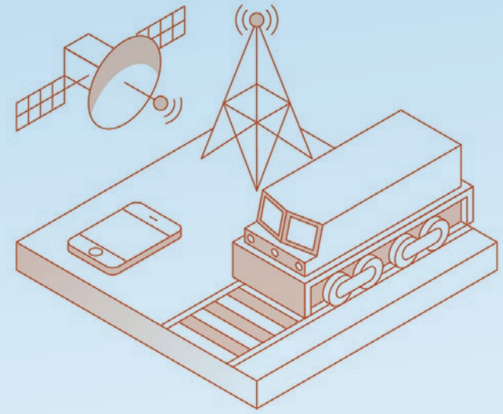
Open Data

For the metric of Open Data, Washington DC, Mexico City, Stockholm and Calgary lead on this Index.

In Washington DC, the Office of the Chief Technology Officer, via its Comprehensive Plan, has created goals and programs to continually improve its digital infrastructure (wireless networks, fiber optics and broadband telecommunications) citywide. The district sees accessible digital connectivity as important to residents and businesses, as well as being critical for economic development. There has also been an emphasis on equity by making a major effort to provide network availability to citizens in low socio-economic communities.



ECONOMIC INFRASTRUCTURE



Logistics and Freight Productivity

Drilling down on an important component of economic growth, we shine a spotlight on the cities that led on Logistics and Freight Productivity (Beijing, Seattle, Washington DC, Copenhagen, Dubai and Sydney).

Seattle's Freight Master Plan (FMP), adopted in 2016, was developed to address the characteristics, needs and impacts of freight mobility. The Duwamish Manufacturing/Industrial Center (MIC) and the Ballard-Interbay Northend MIC account for more than 64,000 jobs, which is 15 per cent of all jobs in Seattle. A network of marine terminals, railroads and rail spurs, roadways, and airports serve the MICs.

A big proportion of the freight industry is reliant on the road network to transport goods. In 2011, 68.5 per cent of freight tonnage and 80.7 per cent of freight-related revenue in Washington was carried by truck. Nearly half of all goods exported from Seattle region ports originate in Washington. Most of these goods travel to the ports via truck (44.2 per cent) or rail (41.6 per cent). The remaining 14.2 per cent corresponds to pipeline, barge or ship, and mainly reflects crude petroleum activity. With so much of the Seattle economy reliant upon truck movements, roadway infrastructure is critical to the local, regional, and state economy.

In the USA capital, Washington DC, the 2017 District Department of Transportation (DDOT) Freight Plan provides recommendations and performance metrics for freight infrastructure and logistics. Many of the ongoing and short-term projects in this plan are funded through DDOT and FAST Act freight funds. Freight in Washington DC is transported via highway, rail and air, with highways being the dominant mode. Highways connect freight to rail and air freight hubs in and around the city. While DDOT's plan mentions these multimodal connections, it does not have plans for creating a multimodal freight hub

Several projects in Washington DC address the National Gateway project's goals to remove tunnel and other overhead clearance restrictions to allow double-stack train movements between the Mid-Atlantic and the Midwest. The District Freight Plan recommends conducting a pilot off-peak delivery program in which deliveries can only be made between 7:00pm and 6:00am, to help reduce traffic congestion and delays associated with freight deliveries.

Copenhagen is the preferred hub for logistics and supply chain management across many industries. It offers big cargo and logistics parks with direct access to highway, railway and sea transport to the rest of Denmark, the Nordics, Germany and the rest of continental Europe. The Copenhagen-Malmo Port is the largest hub for new cars in the Nordics and the Baltic Sea region.

Approximately 58 per cent of goods going in and out of Copenhagen, are transported by road and 10 per cent of all global trade is transported by Danish shipping companies. Copenhagen Airport provides the perfect gateway for transport and logistics to Scandinavia, the Baltic Sea region and Northern Europe, with next day delivery access to about 100 million affluent consumers. Freight giants such as DHL Express, UPS, TNT, PostNord and FedEx, all use Greater Copenhagen as their logistics hub.

Large investments in cross-border freight connections are being prioritized, including the CAD13.5 billion Fehmarn Belt Fixed Link between Denmark and Germany.This will be the most advanced and longest immersed tunnel in the world, cutting freight journeys by as much as 160 kilometers. Other projects being studied include the three kilometer Helsingborg-Helsingor crossing to replace traffic ferries between Denmark and Sweden, and an extended metro from Copenhagen to Malmo to relieve road traffic on the Oresund Bridge.

In the Middle East, Dubai has a coherent policy and good global connectivity, which undoubtedly helps the city serve as a natural gateway between Europe and the Far East. Jebel Ali port and the associated free zone is capable of handling approximately 15 million twenty foot equivalent units (containers) per year. The introduction of free zones has also facilitated market growth by easing the regulatory standards and making Dubai an even more attractive option for companies and investors.

In Australia, Sydney established a high-performance motorway orbital (Westlink M7) in 2005 bypassing the central business district, and it continues to develop plans for an outer orbital (M9) motorway. An inland rail freight corridor is being planned to take loads away from the heavily populated coast while introducing multimodal interchanges. A City Deal identifies two future multimodal interchanges within the Western Sydney Plan.

Moving to the United Kingdom's north, Manchester, is a focal point of the Northern Powerhouse Initiative. Launched in 2015, it aims to redress the economic imbalance between the north and south by showcasing what the north offers across myriad industries and services. In January 2018, the Initiative got fresh impetus with the launch of a campaign to boost the region's global appeal, with China as the main focus.

Global Connectivity

Several cities ranked highly for Global Connectivity, specifically, Beijing, Melbourne, Singapore and Mexico City. With robust growth forecast for Melbourne, planning is well advanced on projects to improve its air and sea gateways. The curfew-free Melbourne Airport provides benefits to available capacity, and planning is underway to develop a third runway. At the Port of Melbourne, capacity is being expanded to meet the increasing number of units/containers that will utilise the port.

Mexico City is building a new airport in the city's north-east that will be six times larger than the current one. It will have three runways in its first stage. Even today's airport boasts the most traffic in Latin America, being used by 30 airlines, of which 23 are international, flying to more than 50 destinations. Last year, international passenger traffic rose 10.3 per cent, closely followed by 8.5 per cent at the domestic level.
During the past five years, passenger traffic through Mexico City grew by nine per cent compared with 4.3 per cent globally.

London also has good global connectivity and it will improve as the expansion plans for Heathrow's Airport (Third Runway) are implemented.

Fixed Internet: Speeds and Feeds and Mobile Internet: Wi-Fi, 5G and Narrowband IoT

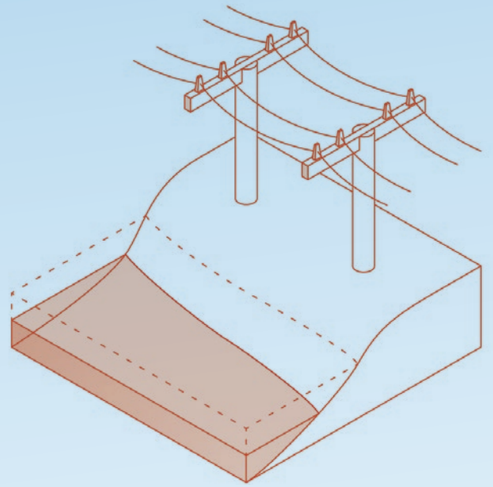


The cities that lead on the provision of powerful fixed internet services are Toronto, Vancouver, Montreal and Calgary, with Seoul carrying the flag for Asia.

Canadian cities dominate this space because some years ago, the federal government in Ottawa recognized that modern telecommunications services are fundamental to its future economic prosperity, global competitiveness, social development and democratic discourse, and the private sector responded. The primary providers – Rogers, Bell and TELUS – as well as Shaw, Videotron, SaskTel, Freedom Mobile and Cogeco, have mature networks on fiber and/or mobile, and are continuing to invest heavily in their infrastructure.

A similar story can be told about the city which leads for the provision of mobile internet services, Dubai. The city invested heavily in the development of these services and as a result, citizens and visitors enjoy average mobile download speeds of 53 Mbps (compared to the global average of 23 Mbps) and readily available Wi-Fi. Dubai will also adopt 5G, which will provide between 1-to-10 Gbps and enable large-scale adoption of internet-enabled devices connecting globally via the Internet of Things (IoT).

RISK MANAGEMENT



As part of our research, we considered two high-risk areas for cities that are preparing for the future – Climate Change and Power Generation and Distribution – both require government alignment, buy-in from industry, well-articulated policy and achievable targets..

Climate Change



The cities that demonstrate leadership in Climate Change are Vancouver, Stockholm, San Francisco, Toronto and Washington DC.

Vancouver leads the Climate Change metric, followed by San Francisco, Toronto and Stockholm. Vancouver's The Greenest City Action Plan is an ambitious strategy to stay at the leading edge of urban sustainability, with a set of measurable and attainable targets. The action plan outlines 10 goals and has three areas of focus: Zero Carbon, Zero Waste and Healthy Ecosystems. Some of the targets are to reduce community-based GHG emissions by 33 per cent from 2007 levels by 2020, to require all buildings constructed from 2020 onward to be carbon neutral in operations, to increase sustainable modes' share of transportation to more than half and to reduce energy use and GHG emissions in existing buildings by 20 per cent over 2007 levels.

In Stockholm, carbon neutrality is a focus area of the regional development plan. The city regularly ranks as one of the greenest cities in the world. It has adopted a strategy to become fossil-fuel free by 2040, which sets out the path, as well as targets for 2020 and 2030, including a fossil-free municipal organization by 2030. The city council voted to implement a ban on certain fuels in inner-city areas to improve air quality. The ban implementation is expected by 2020.

San Francisco has also been on the forefront with Climate Change, having an in-depth climate action strategy that includes direct risk and transitional risk. These risks are addressed in planning frameworks with strategies for sustainability and resilience. The direct risks assessed are sea level rise, flooding, heat waves, water and energy supply interruption, transportation breakdown, property damage and ecosystem risks – a comprehensive approach. The city has already taken big steps to reduce its total carbon footprint via more efficient buildings, less waste and cleaner transportation, with an 80 per cent reduction target set for 2050.

Power Generation and Distribution

San Francisco, Edinburgh, New York, Vancouver and Washington DC all have strong policies in place for the future provision of power generation and distribution.

Edinburgh's Sustainable Energy Action Plan includes targets of 30 per cent of overall energy demand met by renewables by 2020 and 100 per cent of gross electricity demand from renewables by 2020.

Several renewable projects are being funded, including the Edinburgh Community Solar Cooperative Solar PV project.

Work in smart grids includes the Smart Meter Street program that aims to trial smart meters to demonstrate how energy can be saved. The first phase of this program is funded.

The council has established Energy for Edinburgh, an energy services company that will be charged with delivery of major energy initiatives included in the Sustainable Energy Action Plan.

In New York City, the power supply is among the least carbon-intensive in the USA. It includes nuclear and hydro generation, which accounts for half its needs. Con Edison serves the private market, and New York Power Authority has a role in suppling public sector buildings. The city and Con Edison have supported state level initiatives to improve energy efficiency, increase renewable energy and reduce GHG emissions. The New York Power Authority and Con Edison are leaders in smart grid infrastructure. By 2022, five million more smart meters will be installed. Offshore wind is another source that will be a contributor to NYC's power grid in the future.

Brisbane, Melbourne and Sydney have experienced some policy uncertainty during the past decade. Specifically, policy uncertainty on climate change mitigation has led to an under-investment in new generation infrastructure to replace aging power stations, although Australia is well on track to meet its Renewable Energy Target obligations of 33,000 GWh by 2020.

The Brisbane City Council's Plan: Brisbane. Clean, Green, Sustainable 2017-2031, highlights key initiatives for the city. The Queensland State Government is addressing clean energy through its Powering Queensland Plan that includes a target to achieve 50 per cent renewable energy by 2030, to reduce emissions and act on climate change, create new jobs and diversify the state's economy. Queensland is also looking at new policy around waste, thereby potentially encouraging other forms of energy generation from waste.

The Melbourne and Sydney City Councils have commissioned major studies and developed subsequent strategies to address GHG reductions. Melbourne City Council (MCC) has gone a little further in linking its targets to meet or exceed the minimum 1.5 degrees Celsius science-based target from the Paris Climate Change Agreement. MCC has also been investing directly through its Melbourne Renewable Energy Project to purchase power from a windfarm development in Victoria. The Victorian Government also has an auction process in place to purchase more renewable energy through the Victorian Renewable Energy Auction Scheme (VREAS) program.



METHODOLOGY

A Tale of Our Cities assesses what cities are planning and enabling to be built and the physical fabric on which future social and economic activity will play out.

It comprises two components:

Part One: Scored qualitative assessments of city plans that have jurisdiction over the city at a local, state/ provincial or national level.

Part Two: Socio-economic statistics for today, and projections to 2025 and 2035.

The city assessments are focused on four themes which shape the built environment.

Underpinning each theme are the key metrics that were assessed and scores applied, one-to-10 (1 = poor / 10 = outstanding). The subjective scoring approach is based on evidence of forward looking policies, initiatives and funding, as outlined in the city plans.

THEMES	PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
KEY METRICS	Housing	Infrastructure: Public Transit	Connectivity & Infrastructure	Power Generation & Distribution
	Public Realm	Logistics & Freight Productivity	Fixed Internet: Speeds & Feeds	Water Treatment & Distribution
	Urban Green Space	Global Connectivity	Mobile Internet: Wi-Fi, 5G, Narrowband IoT	Waste Management
	Social Infrastructure	Infrastructure: Pedestrians & Cycling	Open Data	
	Climate Change	Built Form: Parking Provisions	Information & Data Security	
		Future Mobility: Services	Planning & Policy	
		Future Mobility: Technology		

The key metric scores are averaged to achieve a total theme score out of 10. The theme scores are averaged to achieve a total city score out of 40.

The cities that are included in this Index are ones that WSP has a strong local footprint in.

Part two of this Index tells a tale by numbers, with statistics sourced from The Economist Intelligence Unit (EIU).

Population & Demography

- Population (and city population as a percentage of country)
- Gender (as a percentage of city population)
- Education (tertiary qualifications as a percentage of city population)
- Labor force (working-age population as a percentage of city population)
- Net foreign migration (as a percentage of city population)
- Household size (number of people per household).

Economy

- GDP
- Employment (as a percentage of labor force)
- Median household income (median nominal disposable income at Purchasing Power Parity, PPP, earned by households)
- Personal disposable income (total value of personal income after taxes and deductions at PPP).

Stability

- Terrorism (threat of terrorism)
- Crime (prevalence of petty crime)
- Violent crime (prevalence of violent crime)
- Civil unrest (threat of civil unrest or conflict)
- Stability (overall stability rating).



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RANKINGS

RANKING	CITY	CITY SCORE
1	Seattle	29.58
2	Copenhagen	29.52
3	Stockholm	29.19
4	New York	28.59
5	Vancouver	28.56
6	Singapore	27.97
7	San Francisco	27.84
8	Montreal	27.73
9	Washington DC	27.71
10	Toronto	27.55
11	London	27.51
12	Manchester	26.60
13	Auckland	25.76
14	Melbourne	25.60
15	Sydney	25.42
16	Dubai	25.40
17	Beijing	25.25
18	Seoul	25.22
19	Edinburgh	24.17
20	Calgary	23.76
21	Brisbane	23.02
22	Mexico City	18.61
23	New Delhi	17.50
24	Bogotá	14.36





01





SEATTLE

Situated along the waters of the Puget Sound, Seattle's moderate marine climate makes the region a popular destination for tourists, interstate migrants and citizens of Washington.

AT A GLANCE

RANKED **01**
CITY SCORE **29.58**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.9/10	**6.8/10**	**8.5/10**	**7.4/10**

Summers rarely become too hot and winters remain mild. Attractions like the Space Needle, Pike Place Market, Hiram M. Chittenden Locks and Washington Park Arboretum are pleasant regardless of season. Seattle is also a gateway for those seeking leisure and recreation outside the city. Western Washington's active and violent geologic history shaped the rugged terrain of the outlying region. Oceans, mountains, deserts, old-growth forests and wildflower meadows are all only a few hours by car, bike or shuttle bus.

Seattle is home to some of the world's largest tech giants such as Amazon, Microsoft and Expedia as well as firms with global supply chains like Costco, Boeing, Paccar, Starbucks and Nordstrom. Abundant job opportunities bring those seeking to live, work and play in a global city like Seattle. The rapid growth of high-tech industries brings a wave of high-wage earners.

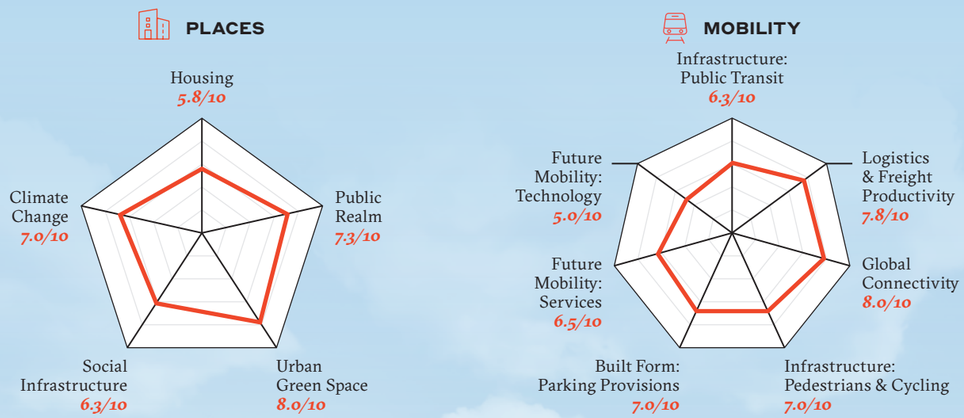
Consequently, Seattle's housing market struggles to meet demand. With the nation's third largest homeless population, Seattle struggles to deal with the problems that a lack of housing affordability brings.

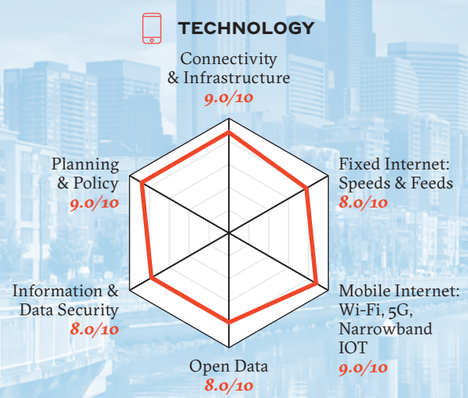
Gentrification continues to displace people and businesses, impacting the vibrant character of some of the city's most beloved neighbourhoods. As people are pushed to seek housing well outside of the city, the region's highway network operates at capacity.

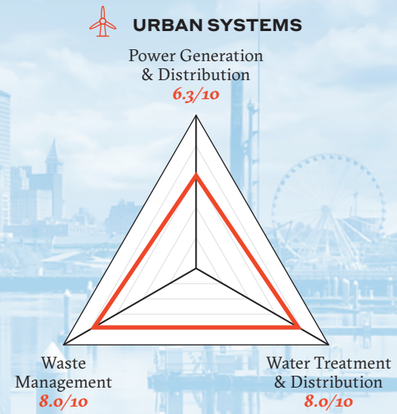
As with many US cities, transportation infrastructure continues to erode and degrade. Seattle is no exception. Susceptible to natural disasters such as earthquakes, flooding and landslides, some of Seattle's most at-risk structures could fail in the next large-scale seismic event. Regardless of the state's efforts to raise the necessary funds for retrofitting and rehabilitation, the region implements some of the nation's most regressive tax schemes — relying on sales tax instead of income tax — a policy that disproportionately affects low to middle income individuals and families. Seattle's recent effort to enact a local income tax was met with a largely negative response.

Despite these issues, Seattle continues to flourish amid investment that aims to address some of these challenges.

CITY ASSESSMENT







PLACES
6.9/10

HOUSING

SCORE: **5.8/10**

As one of the fastest-growing cities in the United States of America, Seattle is entering an era of rapid change. Forecasts suggest that in the next 20 years, Seattle will need to accommodate 70,000 additional housing units, 120,000 more residents and 115,000 more jobs.

Seattle's unique geography means the city is particularly space-constricted, so land use will need to be adjusted to fit more jobs and housing into existing communities. Most compact development is concentrated in urban centers or urban villages. Urban villages are complete, mixed-use neighbourhoods in which residents have access to employment, transit and retail services that meet their daily needs. By locating more housing, jobs, shops and services near each other, Seattle aims to reduce reliance on cars, limit traffic congestion and decrease greenhouse gas emissions. Since 2005, more than two-thirds of Seattle's new housing units have been constructed in commercial and mixed-use space.

Despite record levels of housing development and construction, Seattle has been unsuccessful in meeting demand. In March 2018, home prices in Seattle climbed by CAD56,000, taking the median home price to well over CAD1 million. An influx of high-earning workers, largely concentrated in the technology sector, makes Seattle an ideal location for developers to construct luxury housing.

Long-time residents question whether they can continue to afford to live in a city where median home prices, rents and the general cost of living increases year after year. This trend continues to displace the city's most vulnerable populations. Years of gentrification have left their mark on Seattle's neighbourhood landscape, which tends to stratify regions by socio-economic status.

Housing affordability is partly influenced by regional and local land-use policies, development regulations and permit processes. Understanding the need to meet current and projected regional housing requirements, in early 2016 the Seattle City Council approved Mandatory Housing Affordability (MHA) for a handful of neighbourhoods. MHA ensures that new commercial and multifamily residential development contributes to affordable housing.

MHA aims to provide at least 6,000 new rent-restricted, income-restricted homes for low-income individuals and families. This northern autumn the council will vote to implement MHA citywide.

PUBLIC REALM

SCORE: **7.3/10**

The unique topography proved challenging in the early days of planning a street grid. A series of massive regrades and infills moved almost 300,000 cubic meters of earth and shaped the land we see today. A disagreement between Seattle founders resulted in a disjointed street grid; some founders believed streets should run north and south, while others insisted they run parallel to the shoreline.

Today, Seattle streets form a vibrant city connecting people, places and products through a variety of proven and innovative policies and designs. Greenways, street ends, mini-parks, planting strips, play streets, block parties and other activating uses of the right-of-way bring together community members and local businesses to create fun and relaxing safe spaces for pedestrians to explore and socialize.

The Seattle Department of Transportation's (SDOT) annual *Park(ing) Day* turns on-street parking into public spaces to reinforce the importance of walkable, livable and healthy communities. Community P-Patches and gardens provide spaces where neighbours come together to steward — plan, plant and maintain — a piece of open space. These gardens serve as gathering places that strengthen neighbourhood networks through cooperative ventures and offer a visible product of land stewardship as well as a healthier urban environment.

When the rain relents in late spring and summer, Seattle's Out to Lunch concert series enlivens public squares and piazzas with a variety of food trucks, seating, live music and games. Throughout the year, Seattle's public squares host urban art installations that inspire and provide clear wayfinding that encourage both visitors and residents to explore surrounding attractions.

The transformation of the waterfront should begin in earnest later this year when the three-kilometer tunnel replacing the Alaskan Way Viaduct opens. Built in 1953, the viaduct, or SR 99, suffered structural damage in the 2001 Nisqually earthquake, threatening the safety of its 100,000 daily users. In early 2009, Seattle voters approved a plan to replace the deteriorating structure.

Despite early construction setbacks, including a 24-month delay because of damage to a tunnel boring machine, underground Alaskan Way is due to open late this year. Demolition of the viaduct will allow the reconnection of the urban core to the waterfront piers via a landscaped promenade featuring local vegetation, art installations and unobstructed views of Elliot Bay and the Olympic mountain range. This promenade will also enhance the Pike Place Market expansion, providing its 10 million annual visitors a pleasant walk to waterfront businesses and attractions.

The waterfront is also a terminus for thousands who commute by ferry and water taxi. During the summer, Seattle hosts more than a million cruise ship passengers that bring an estimated revenue of CAD650 to shops and businesses. The reconstruction of the Elliot Bay Seawall and Colman Dock seeks to accommodate safe, comfortable and efficient travel by pedestrians, cyclists, vehicles and freight.

URBAN GREEN SPACE

SCORE: **8.0/10**

Seattle boasts one of the best designed and preserved park systems in the country, thanks largely to the work of the Olmsted Brothers firm of Brookline, Massachusetts. Early in the twentieth century, the Olmsteds left their imprint on Seattle's landscape with a series of parks and boulevards, creating connected green spaces for citizens to enjoy.

Today, Seattle Parks and Recreation (SPR) manages a 2,600-hectare system with more than 485 parks and natural areas, 40 kilometers of boulevards and almost 200 kilometers of trails. Few cities can boast this diversity and abundance of parks, playgrounds and other natural spaces, which covers about 12 per cent of the city's land area. SPR also manages facilities, including 26 community centers, eight indoor swimming pools, two outdoor swimming pools, four environmental education centers and four golf courses. It takes advantage of unique public/private partnerships that enhance Seattle's urban green spaces with community-oriented events. SPR develops, manages and monitors more than 90 contracts with external partners to provide cost-effective and beneficial programs and services.

The Urban Forest Interdepartmental Team, a collaboration between three city departments, SDOT, Seattle Public Utilities and Seattle City Light, seeks to expand tree canopy cover from 28 per cent last year to 30 per cent by 2037. Since 2007, SDOT has planted an average of 1,200 trees a year. The urban forestry team is also responsible for cataloging more than 140,000 trees maintained in the city's right-of-way.

SOCIAL INFRASTRUCTURE

SCORE: **6.3/10**

Seattle Public Schools (SPS) is the largest school district in the state of Washington, with almost 8,000 staff and 50,000 students in 95 schools. The district serves an economically and ethnically diverse population, with more than 40 per cent of students qualifying for free or reduced-price lunch. Students and families come to Seattle from 147 countries and about 30 per cent of students speak a language other than English at home.

Like many urban school districts, SPS still faces a demographic achievement gap. In 2012, of district third-graders, 88.8 per cent of Caucasian students were proficient on the state reading test, compared with 72.9 per cent of Asian/Pacific Islander students, 58.6 per cent of Hispanic students, 52.9 per cent of Native American students and 47 per cent of African American students.

Seattle's Colleges District, comprised of three community colleges and a vocational school, offers workforce education and training, professional-technical programs, bachelor's degrees in career areas and transfer degree programs to nearly 50,000 students each year. Washington State's Direct Transfer Agreement enables community college students to transition to four-year institutions after earning a two-year associate degree. Each year, the University of Washington accepts more than 1,000 students from local community colleges, thus providing an alternative path to earning a four-year degree.

The University of Washington, in northeast Seattle, is an internationally recognized research institution ranking 10th in the Best Global Universities, according to the U.S. News and World Report. The university plays a big role in commercial real estate development in the downtown core. Given to the university in 1861 by Seattle founder Arthur Denny, the Seattle Metropolitan Tract is 4.45 hectares of land spanning several city blocks. Today, the tract is composed of 130,000 square meters of rentable office space, 18,580 square meters of rentable commercial space, 450 hotel rooms and more than 2,000 parking spaces. The newest development, a 58-story mixed-used skyscraper, was recently acquired by Amazon.

The University of Washington Medical Center is one of the premier primary care facilities in the country, ranked the best hospital in Washington State and nationally ranked in several adult specialties. Seattle remains a leader in the fight to eradicate cancer with leading research institutions like the Fred Hutchinson Cancer Research Center and the Seattle Cancer Care Alliance.

Through the Child Care Assistance Program, the City of Seattle helps low and moderate-income working families pay for childcare for children aged one month to 13 years. Families can choose from more than 100 licensed family childcare homes and centers, which contract with the city. The amount of payment from the city varies according to the income of the family, age of the child and hours of care needed, typically between 25 and 70 per cent of a standardized rate.

CLIMATE CHANGE

SCORE: **7.0/10**

Seattle is committed to becoming carbon neutral by the year 2050 to reduce the threat of climate change. Its Climate Action Plan provides long-term planning direction and guidance for climate protection and adaptation efforts through to 2030. Adopted in June 2013, the plan focuses on city actions that reduce greenhouse emissions and support vibrant neighbourhoods, economic prosperity and social equity. Actions are concentrated on areas of greatest need and impact: transportation, building energy and waste. The plan also includes actions that will increase the community's resilience in the face of climate change.

MOBILITY
6.8/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.3/10**

Between the late 1800s and 1930s, Seattle built one of the largest streetcar networks in the USA, but by the 1940s, more than 320 kilometers of track was removed or paved over. For decades after, Washingtonians rejected levies to expand public transit, instead opting to build higher-capacity freeways to cater for suburban development.

Despite historically modest support for transit investment, recent growth in Seattle and suburban regions has exacerbated traffic congestion and caused commuters to seek alternatives. Today, more than 2,000 buses serve the Greater Seattle area supplemented by light rail and a commuter rail service. The State of Washington's Commute Trip Reduction program requires businesses with more than 100 employees to report how they get to work. In 2017, 25 per cent of commuters reported driving alone to work, a 5 per cent drop from a year earlier.

In the city proper, the CAD1.21 billion Levy to Move Seattle outlines a comprehensive plan to improve safety for all travelers, maintain streets and bridges and invest in reliable and affordable travel options.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.8/10**

The Freight Master plan (FMP), adopted in 2016, was developed to address the unique characteristics, needs and impacts of freight mobility. Washington's transportation industry supports nearly 900,000 jobs in the Puget Sound economy through freight-dependent sectors such as agriculture, forestry, construction and manufacturing — producing an estimated economic impact of CAD120 billion. The Duwamish Manufacturing/Industrial Center (MIC) and the Ballard-Interbay Northend MIC account for more than 64,000 jobs, 15 per cent of all jobs in Seattle. A network of marine terminals, railroads and rail spurs, roadways, and airports serve the MICs.

A big proportion of the freight industry is reliant on the road network to transport goods. In 2011, 68.5 per cent of freight tonnage and 80.7 per cent of freight-related revenue in Washington was carried by truck. Nearly half of all goods exported from Seattle-region ports originate in Washington. Most of these goods travel to the ports via truck (44.2 per cent) or rail (41.6 per cent). The remaining 14.2 per cent corresponds to pipeline, barge or ship, and mainly reflects crude petroleum activity. With so much of the Seattle economy reliant upon truck movements, roadway infrastructure is critical to the local, regional, and state economy.

The FMP identifies a network of over-legal and heavy-haul routes that can accommodate oversized truck loads and provides funding to repair and build roadways within the network, calls for semi-annual safety inspections of heavy-haul trucks, and aligns city weight regulations with those of the state and other municipalities across the country. In addition to a heavy-haul network, the City of Seattle outlines a Downtown Traffic Control Zone, which prohibits heavy freight from operating without a permit during peak hours in highly-congested transit corridors.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

The Port of Seattle is an economic engine for the region, supporting thousands of jobs. About 70 per cent of the port's containerized cargo originates in or is destined for regions of the country outside the Pacific Northwest, making Seattle a trade gateway of regional, national and international significance. Two major US railroads are within two miles of container terminals, and two interstate highways are within minutes of all terminals, providing efficient truck and rail access for inland destinations including Chicago, New York and Boston. The port owns one of the largest, most efficient cargo load centers on the west coast of the US.

Operated by the Port of Seattle, the Seattle-Tacoma International Airport (Sea-Tac) serves as the gateway to Seattle, Washington State and the larger Pacific Northwest. As of 2016, Sea-Tac was the ninth busiest airport in the United States, hosting an estimated 46.8 million passengers. Air cargo volume increased by more than 10 per cent between 2015 and 2016, and totaled more than 425,000 tons in 2017. Sea-Tac offers non-stop flights to more than 90 domestic and 25 international destinations.

At present, Sea-Tac serves as a hub for Alaska and Delta Airlines. Between 2016 and 2022, the Port of Seattle estimates that CAD4.2 billion will be spent on major capital projects, small improvements and overhead costs. This is a 280 per cent increase from the previous six years. The projects include a new international arrivals facility.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **7.0/10**

As part of Seattle's Vision Zero Plan — zero traffic related deaths by 2030 — SDOT commissioned Bike and Pedestrian Safety Analysis to use advanced modelling techniques to determine the most dangerous intersections. This analysis was used to prioritize traffic calming efforts and access improvements across the city. This systemic, risk-based approach enables SDOT to proactively address safety issues, aiming to prevent bicycle and pedestrian accidents before they happen.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.0/10**

SDOT seeks one or two open and available parking spaces on any block throughout the day. To meet this goal, the city has adopted performance-based pricing strategies to balance the competing needs of transit, customers and residents. SDOT carefully regulates curb space, installs and maintains paid parking, loading and short-term access in business districts. Its Restricted Parking Zone program was created to help ease parking congestion in residential neighbourhoods around demand generators such as light rail stations and hospitals by limiting on-street parking to residents and short-term visitors.

Recently, the Seattle City Council eased off-street parking requirements for new development. Off-street parking is not required for housing near a frequent transit service. Since 2004, the average parking spaces per new unit decreased from 1.57 spaces to 0.63 spaces. In addition to easing requirements for off-street parking, the legislation permits landlords to rent parking spaces to non-tenants.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

Residents enjoy the convenience of a wide array of ride-share, car-share, bike-share and on-demand transportation options. Sea-Tac also provides designated areas for transportation network companies, such as Uber and Lyft, to pick up and drop off passengers. Ride-share services like Car2Go, ReachNow and Zipcar operate in the city as well.

In addition to car-sharing services, Seattle offers three dockless or free-floating bike sharing services including Lime, Spin and Ofo. After a controversial bailout of Pronto, the SDOT abandoned plans to expand docked bike-share, instead inviting private firms for a trial period. The trial was deemed a massive success and Lime is expanding offerings to include motor-assisted bikes.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

When it comes to future mobility technologies such as autonomous vehicles, cities are faced with the challenge of embracing new technologies without changing the way residents live or compromising regulations and quality of life. New technology is transforming transportation systems in cities around the world in ways we do not yet fully understand. Seattle is carefully considering the pros and cons of allowing connected and autonomous vehicles, electric vehicles and unmanned aerial vehicles or drones to operate within the city. It has set parameters for where and how new mobility innovations are tested and deployed.

In 2016, the Office of the Mayor introduced the Drive Clean Seattle initiative. This initiative outlined an aggressive municipal fleet emissions reduction strategy, calling for big infrastructure investment by Seattle City Light, identifying opportunities for public/private partnerships, piloting innovative projects to use electrical assets and accelerating transport electrification. It is Seattle's goal to have 30 per cent of all light-duty vehicles in the city operate under electric power by 2030.

TECHNOLOGY
8.5/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **9.0/10**

Since the mid-1990s, the City of Seattle has regularly studied and assessed the state of broadband services and infrastructure. In 1996, Seattle installed 550 miles of fiber, although much of this cable remains unused, some of it is leased to private companies.

Since this initial public investment, Seattle remains apprehensive about subsidizing broadband infrastructure, instead seeking alternative options for funding. Seattle leverages several public/private partnerships from telecom firms like Xfinity, CenturyLink and Wave to explore opportunities for improved internet access for city residents.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Internet access is the infrastructure challenge of the early twenty-first century and access to the information and services it provides are responsible for economic growth, job creation, education, and a better quality of life. Seattle is exploring all options that would increase the availability of competitive, affordable and equal broadband internet access options that approach one gigabit of bandwidth across the city. Since June 2014, more than 60 per cent of the city's single family households have gained access to gigabit-speed broadband internet services.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

5G represents a next stage in the evolution of mobile wireless technology, and is envisioned to provide much faster speeds then the current 4G technology (e.g., download speeds of approximately 10 Gbps). 5G is seen by many as a central component of machine-to-machine communications and the Internet of Things (IoT). While planning and design and prototype testing of 5G technology is currently underway, full deployment is not expected to begin until 2020.

Seattle is well-positioned to be an early adopter of 5G technology with telecom giant T-Mobile headquartered 15 minutes outside Seattle. In early 2018, T-Mobile announced it would deploy 5G service to 30 U.S. cities. Though those cities have yet to be named, Seattle is expected to be participating in the launch.

OPEN DATA

SCORE: **8.0/10**

Data has the potential to drive innovation, improving both quality of life and economic productivity. Technology creates new opportunities to use data to help reduce traffic congestion, fight crime, foster economic development, reduce greenhouse gases and make local governments more open, responsive and efficient.

Around the world, cities harness the power of sensors and engage citizens equipped with smartphones, cloud computing, high-speed networks and data analytics.

In Seattle, departments are encouraged to use data to make informed decisions, focus on performance management, and to become *open by preference* — making data publicly available to encourage development of innovative solutions that improve quality of life.

Unlocking the promise of a smart, data-driven city requires a focus on data governance, consistent tools that facilitate cross-department collaboration, and educating the public on how to leverage the city's resources.

The City of Seattle uses the Socrata open data platform to share its data with the public. In addition to providing data to the public, the city also appoints open data champions in each department. These champions are responsible for curating their data catalogs and ensuring data is refreshed on a regular basis. The City of Seattle's open data initiative also includes annual risk assessments to identify potential privacy concerns related to data aggregation. Externally, it partners with local technology and community groups to encourage engagement with, and the use of, open data to find solutions to the region's most pressing civic challenges. SDOT and Seattle Public Utilities (SPU) also publish spatial data in proprietary and open-source data formats to accommodate citizen data scientists of varying skill levels.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

The City of Seattle's Privacy Program is designed to provide the structure and guidance required for city departments to incorporate the appropriate privacy practices into daily operations, and to build public trust and confidence in how the city collects and manages the public's personal information.

In 2015, Seattle designed a citywide Privacy Program to provide guidance and tools to city employees when working with personal information. A group of representatives from 15 city departments was convened to create policies and practices to define and implement a citywide program to meet privacy commitments.

Since then, the program has continued to grow. The city now conducts hundreds of privacy reviews each year about the technologies used to deliver services to ensure that new and existing city programs across all departments use and protect the information they collect.

PLANNING AND POLICY

SCORE: **9.0/10**

In 2016, the city commissioned a report to identify areas where publicly-accessible Wi-Fi can have a meaningful impact in Seattle. It was also required to identify potential funding sources, business models, and partners to expand the availability of public Wi-Fi services, especially as a means to address Seattle's digital equity and digital inclusion needs.

The study found that there are opportunities for increasing public Wi-Fi at low or no cost to the city through models that are supported by advertising and other revenue-generating models. However, the city needs to examine the public policy implications of these models and engage the community to determine how these approaches would work in Seattle.

The City of Seattle will consider these options in implementing the most appropriate and effective business models moving forward.

URBAN SYSTEMS
7.4/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.3/10**

Seattle prides itself on being an environmentally conscientious world citizen. Relying on Washington State's vast network of powerful rivers, Seattle's energy is largely derived from hydroelectric sources. In 2016, hydroelectric energy constituted 90 per cent of power provided by Seattle City Light (SCL). Half of this energy is produced by facilities owned and operated by SCL, while the remainder is bought from the Bonneville Power Administration. Less than two per cent of Seattle's energy is produced by fossil fuels. Since 2005, SCL has been greenhouse gas neutral — the nation's first electric utility to receive that distinction.

SCL also maintains more than 1,040 kilometers of transmission lines and towers in Washington's rugged wilderness. Within Seattle, SCL manages more than 3,200 distribution circuit kilometers and 14 distribution substations all connected via a smart grid. The utility's Net Metering Program allows customers to enjoy the reliability of the electrical grid and the option to buy power utility when their system is not generating enough to cover their needs.

The Seattle Energy Code has been consistently ranked among the most progressive codes in North America since its inception 36 years ago. Code concepts developed in Seattle are routinely incorporated into the Washington State Energy Code and increasingly into national standards.

This code is one of the major reasons that SCL can plan on using its existing resources instead of adding new and costly electricity generation from other resources. The Seattle Energy Code requires energy efficiency levels at least 20 per cent better than the present national standard. This drives down energy costs by making high-performance buildings the norm.

WATER TREATMENT AND DISTRIBUTION

SCORE: **8.0/10**

Today, the Seattle water system supplies about 530 million liters of water a day to about 1.4 million people. The system relies on two big regional watersheds, the Cedar and Tolt, which are also home to wildlife and salmon. The 36,680-hectare Cedar Watershed, about 56 kilometers southeast of Seattle, supports a diverse ecosystem and provides about 70 per cent of the drinking water. The rest comes from the foothills of the Cascades in east King County.

In 2016, SPU produced 169 billion liters gallons of treated drinking water, of which 9.1 billion liters were lost to leakage. This 5.3 per cent leakage rate is well below the state standard of 10 per cent. To encourage more efficient water use, the Saving Water Partnership and its 18 water utility partners — set a six-year conservation goal of reducing per capita use. The hope is that the partnership's average annual retail water use would fall to 397 million liters a day this year despite forecast population growth. The goal was met in in 2016, when only 357 million liters a day was used.

WASTE MANAGEMENT

SCORE: **8.0/10**

All residential properties in Seattle are required to have food and yard waste collection service. By law, food and yard waste are not allowed in the garbage and can be met with fines. Many public facilities and spaces provide landfill, recycling and composting bins with guides for those unfamiliar with sorting waste.

In 2012, the Seattle City Council passed an ordinance banning retailers from providing plastic carryout bags and requiring a five-cent fee for paper bags. In July 2018, it also banned plastic straws and utensils.

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02

Serving as a poster child for sustainable cities around the globe, Copenhagen is the capital of Denmark and its cultural, economic and governing center. Situated mainly on the east coast of the island of Zealand, the city is lauded for its old-world charm, progressive outlook and happy population.

AT A GLANCE

RANKED **02**
CITY SCORE **29.52**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
8.0/10	**7.5/10**	**7.7/10**	**6.4/10**

Founded in the tenth century as a Viking village, Copenhagen is a pocket-sized metropolis that has many districts with unique architecture, parks and water. The ultimate bike-friendly city, Copenhagen has pledged to become the world's first carbon-neutral capital by 2025.

Boasting a strong and stable economy based largely on services and commerce, Copenhagen's success is underpinned by high skills and employment, strong innovation, low carbon emissions and a long-term commitment to building a *city for the people*.

Cited as an exemplar of integrated urban planning, the city revolves around a five-finger plan. This distinct pattern has resulted in well-planned transport routes that run straight through the center of the city to minimize traffic congestion, enhance public transport efficiency and create safe walking and cycling routes. Planning caters to pedestrians and cyclists ahead of motorists while the public transport system and the large network of roads and highways are well connected.

Copenhagen has a mixed-use center, bold contemporary architecture and public spaces that are culturally engaging and diverse. In terms of developing Denmark's infrastructure, investments are being made in modern hospital facilities, a range of urban developments, buses that run on clean fuel, as well as the expansion of the Copenhagen Airport, bike routes and road networks.

With increasing adoption of smart technologies, Copenhagen is well prepared for the future.

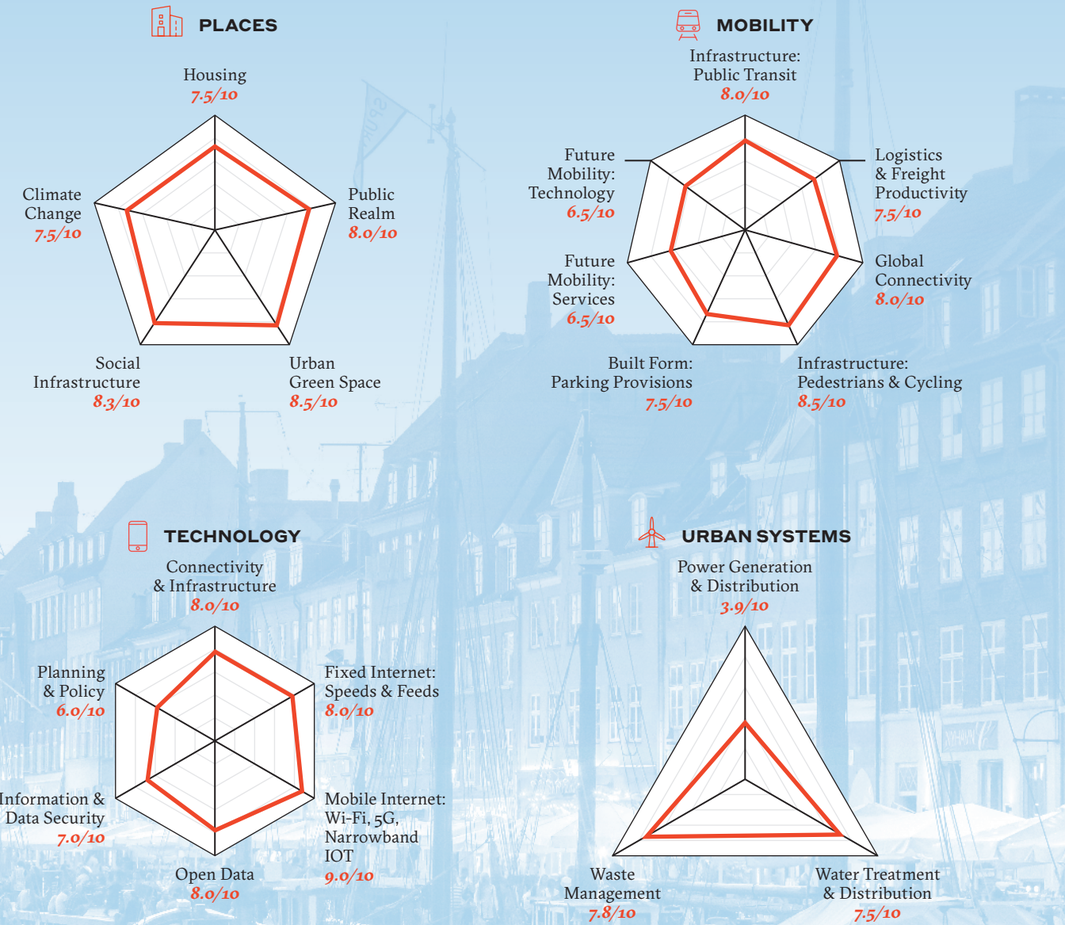






COPENHAGEN

CITY ASSESSMENT



PLACES
8.0/10

HOUSING

SCORE: **7.5/10**

Demand for housing in Copenhagen is on the rise as 200 people move to the city each week from other parts of Denmark and overseas. Copenhagen is Europe's second most desirable city for property investment and development and 25 per cent of all new real estate investments are foreign.

In 2013, the city began construction of an additional 2.5 million square meters of housing and three million square meters for business, due as a preemptive measure to cope with the forecast population growth. At present, an average 61 per cent of household disposable income in Copenhagen is spent on housing. Only 20 per cent of housing units in the Danish capital are owner-occupied, and there is an even split of private rentals, cooperative housing and social housing.

Copenhagen Municipality has recently introduced a mandate that a quarter of all new housing developments must have an area allocated for affordable housing. Several nearby municipalities are also choosing to adopt this concept.

PUBLIC REALM

SCORE: **8.0/10**

Christiansburg, the Danish Parliament built in 1928, is the tallest building in central Copenhagen, where the maximum building height is six stories. In 2012, a law was introduced prohibiting construction of skyscrapers. The Danish Government is debating whether buildings up to 200 meters high should be allowed in dedicated new areas surrounding central Copenhagen. Forty-nine high-rise buildings are being proposed by developers.

More roads are being redesigned to have reduced lanes for cars, allowing room for more pedestrians and cyclists. Most one-way streets in central Copenhagen either have been or soon will be, redesigned to have reduced lanes for cars, allowing two-way travel by cyclists.

Since 2008, both the north and south harbor areas of Copenhagen (Nordhavn and Sydhavn), which were solely used for port and industrial purposes, have been redeveloped and expanded to become *new city districts*. They still cater for industrial and port services, but the area now includes businesses, shops, restaurants, housing, educational and green space. Extensions to the existing metro line are being built to link to both Nordhavn and Sydhavn.

URBAN GREEN SPACE

SCORE: **8.5/10**

Urban green space in Copenhagen, demanded by the locals, is a hot political issue.

In 1947, the Copenhagen Finger Plan was adopted as the town planning direction for future urban areas of Greater Copenhagen. The palm of the hand represented central Copenhagen and the five fingers the areas of growth. Greater Copenhagen was deliberately planned to allow plenty of room for green space across the metropolis consisting of recreational facilities (including sports grounds), forests, grassland and agricultural land.

Two low-lying areas in southern Copenhagen were reclaimed from military use and redeveloped to allow for more urban green space. One is a large nature area and the second is a five-kilometer beach park along the coast.

Copenhagen Green is an initiative dedicated to providing information to citizens and visitors on more than 100 green and blue spaces in Copenhagen.

SOCIAL INFRASTRUCTURE

SCORE: **8.3/10**

Most recently, Denmark has given healthcare needs higher priority. Seven big state-of-the-art hospitals are being built (three in Copenhagen) and 11 existing hospitals throughout Denmark will be renovated to the standard of the new facilities.

There is also a strong focus on modernizing educational facilities, most of which were built in the 1960s.

All education (primary, secondary and tertiary) is free for Danish citizens. The government provides a monthly allowance (SU – Statens Uddannelsesstøtte) to all Danish citizens over the age of 18 enrolled in education to cover living expenses. The monthly amount varies between CAD415 to CAD1,040 and is calculated according to individuals' socio-economic circumstances.

All newborn children in Denmark are guaranteed an allocation in a nearby nursery. The price for childcare in Copenhagen is CAD624 a month (about eight per cent of household disposable income), making it easy for mothers to return to the workplace within six to 12 months after giving birth.

Several areas are undergoing transit-oriented development. They include the former Carlsberg brewery site and Nordhavn and Sydhavn. Each area has integrated residential, retail, educational, cultural and sports facilities. Accessibility to these redeveloped areas is a huge priority, hence the extensions to the Metro line to link Nordhavn and Sydhavn.

CLIMATE CHANGE

SCORE: **7.5/10**

Copenhagen plans to become the first carbon-neutral city in the world by 2025 and to have no fossil fuels by 2050. In the 21 years to 2016, the city halved its carbon emissions.

District heating warms 98 per cent of Copenhagen houses and recently, district cooling was introduced, reducing energy spent on cooling buildings and factories by 70 per cent compared with conventional air conditioning.

By 2019, 40 zero-emission buses will be in regular service, and the entire bus fleet in the capital will be electric by 2031. Traffic signals are being reconfigured to ensure the least possible air pollution occurs while, at the same time, ensuring good traffic flow. The City of Copenhagen has just entered an agreement with Google Street Cars for measuring air pollution to ensure an effective map can be generated. Copenhagen is currently ranked second out of 23 major cities in Europe for best air quality.

As a pilot project, Copenhagen has renovated some old apartment buildings to be climate-proof and enhance residents' quality of life. A stream was placed in the center of one apartment block's courtyard, connecting the buildings to a supply of collected rainwater. This allowed the rainwater to be channeled into houses for laundry and toilet flushing purposes. The innovative design feature reduced grid water consumption of the properties by 27 per cent. In addition to handling rainwater on the property and consequently preventing flooding, the renovation also reduced heat-island effects, lowering the buildings' CO_2 emissions by 16,800 tons. This project will be soon be rolled out in other areas of Copenhagen.

National framework conditions can help Copenhagen achieve the targets laid down in the CPH 2025 Climate Plan but the city needs to lobby the government to allow some improvements to occur.

MOBILITY
7.5/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **8.0/10**

The city is well connected and getting around it from the outskirts has been made easier for the public by providing several options to combine cycling and public transport. A national regulation was recently introduced mandating that all new office buildings be within 600 meters of a railway station.

Residents have plenty of public transport options: local train, regional train, ferry, bus and an underground metro system. A second metro route with 17 stations is due to open in 2019, with further extensions to the metro network already underway. In 2024, a 28-kilometer light rail line in northern Copenhagen will connect with six local train lines and numerous bus routes.

All trains, metros and ferries in Copenhagen allow cyclists to take their bicycles along for the ride. It is free to take your bicycle on the local train, and there are at two dedicated carriages on each train fitted so cyclists can park their bikes and sit nearby. Cyclists taking their bicycles on the metro, ferry or regional trains need to pay for a bicycle ticket. All local train, regional train, metro and most bus stations have big bicycle parking facilities.

Travelers pay by using the public transport travel card (rejsekort), three dedicated apps or using vending machines at train/metro stations or when boarding a bus or ferry. The travel card can be used on all trains, buses, ferries and metros throughout Denmark and not just for an individual's trip. It can also be used to pay for up to an extra four adults, four children or a bicycle for their journey. If travelers check out and then check in again in the same travel zone within 30 minutes, the travel card converts the two separate journeys into one, so only one journey is charged.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.5/10**

Ranked in the top five logistics regions in Europe, Copenhagen is the preferred hub for logistics and supply chain management across industries. It offers big cargo and logistics parks with direct access to highway, railway and sea transport to the rest of Denmark and the Nordics as well as Germany and the rest of continental Europe. The Copenhagen-Malmo Port is the largest hub for new cars in the Nordics and the Baltic Sea region.

Fifty-eight per cent of goods in and out of Copenhagen are transported by road, and 10 per cent of all global trade is transported by Danish shipping companies.

Copenhagen Airport provides the perfect gateway for transport and logistics to Scandinavia, the Baltic Sea region and Northern Europe with next-day delivery access to about 100 million affluent consumers. Therefore, big companies such as DHL Express, UPS, TNT, PostNord and FedEx all use Greater Copenhagen as their logistics hub.

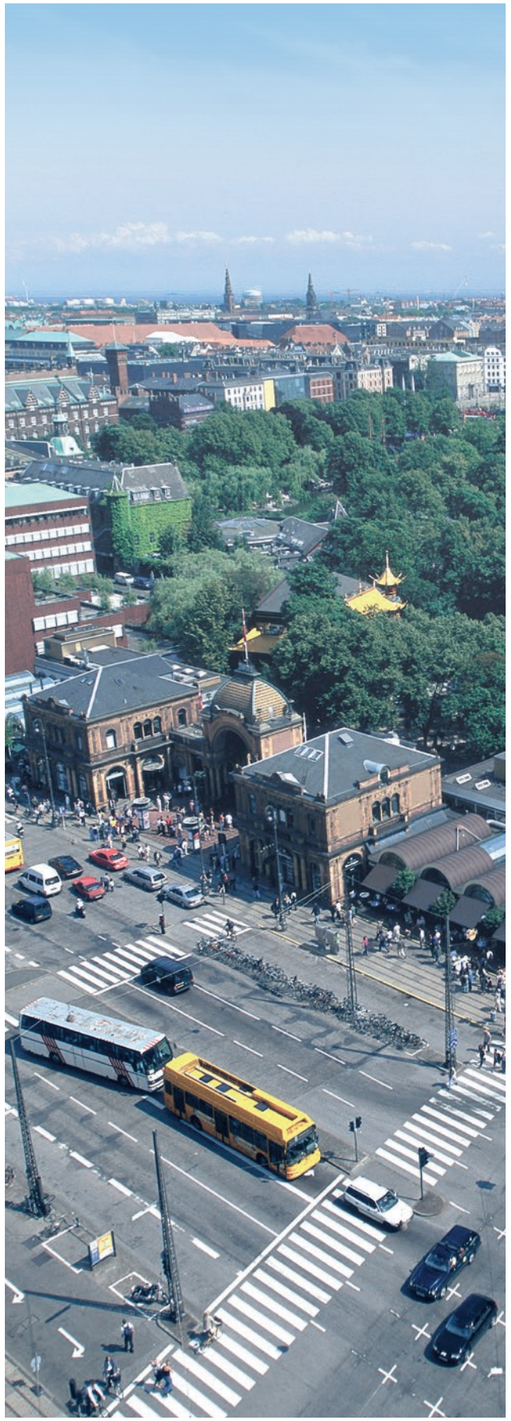
Large investments in cross-border freight connections are being prioritized, including the CAD13.5 billion Fehmarn Belt Fixed Link between Denmark and Germany. This will be the most advanced and longest immersed tunnel in the world, cutting freight journeys by as much as 160 kilometers. Other projects being studied include the three-kilometer Helsingborg – Helsingor crossing to replace traffic ferries between Denmark and Sweden, and an extended metro from Copenhagen to Malmo to relieve road traffic on the Oresund Bridge.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

Copenhagen has one main major airport, but nearby is Roskilde airport (40 minutes west of Copenhagen in Denmark) and Malmo airport (40 minutes east of Copenhagen in Sweden). Copenhagen's main airport is the biggest in the Nordics and the third busiest airport in northern Europe. There are 165 flight routes from Copenhagen airports, operated by 70 airlines.

The airport serves more than 25 million passengers each year, most of whom (83.5 per cent) are traveling internationally. Only 6.1 per cent are domestic travelers and the remaining 10.4 per cent are intercontinental travelers.



Copenhagen Airport was named the best airport in Europe and ranked seventh in the world by the magazine Condé Nast Traveler.

The airport is eight kilometers from the city center and easily accessible by train, metro or road (bus or car). It is only a 13-minute journey on the metro.

Copenhagen Airport plans to double its size, expanding terminals, aircraft stands and other facilities so it can serve 40 million passengers annually. The expansion will also make room for a new large cargo and logistics park (320,000 m²) linked directly to the existing cargo area and close to the highway.

Great road and rail networks mean that it is 40 minutes' journey to Malmo, four hours by car or train to Hamburg, five hours to Stockholm, and nine hours to Berlin. The planned Fehmarn belt road and rail tunnel between Denmark and Germany, due to open in 2028, will reduce the travel time from Copenhagen to Hamburg from four hours to two-and-a-half hours.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **8.5/10**

In the past decade, CAD200 million has been invested in cycling and pedestrian infrastructure and facilities. Since 2015, 16 new bridges for cyclists and pedestrians have been commissioned. Half of them are now open.

Getting around Copenhagen from the outskirts has been made easier for the public by providing several options to combine cycling and walking with forms of public transport. All trains, metros and ferries in Copenhagen allow cyclists to take their bicycles on the journey.

Copenhagen is rated the best of 136 global cities in the Bicycle Friendly Cities Index, with 454 kilometers of cycle lanes, some of which are *cycle super highways* from the outskirts of Copenhagen into and across the city center. Sixty-two per cent of residents ride their bicycle to work or education, and only nine per cent commute by car. Cycling is the fastest way to navigate around the city (according to 53 per cent of people). It is easier than taking public transport or driving (50 per cent), and it is a great way to exercise (40 per cent).

It is estimated that the cycling population contributes CAD350 million annually in public health savings, which is enough to pay off the cost of new bicycle infrastructure in less than five years. Hence, Copenhagen is continually striving to introduce measures to deter citizens from driving and instead invest in pedestrian, cycling and public transport options. During heavy snowfall, Copenhagen municipalities prioritize clearing cycle lanes before clearing motorists' lanes.

Apart from conventional bicycles (road, mountain, hybrid or electric), 17 per cent of Copenhagen households own a cargo bike used mainly to transport children, pets or shopping. A quarter of cargo bike owners opted for a bike instead of owning a car.

Copenhagen Municipality has implemented an intelligent transport system to further promote cycling and the use of public transport. The management platform can monitor the traffic situation and intervene for the benefit of cyclists and public transport users. By connecting the platform to municipal traffic signals, it can cut 10 per cent off cyclists' travel time and reduce bus passengers' travel time by up to 20 per cent. Cyclists are prioritized with targeted real-time information on electronic information boards along the cycle paths. By strengthening both biking and public transport methods, Copenhagen hopes to make green transport even more attractive and cut CO_2 emissions from the transport sector.

In 1995, Copenhagen introduced a bicycle-sharing scheme with 1,000 bicycles. The system was abolished in 2012, and in 2014, 18,00 electric city bikes with a screen on the handlebars displaying GPS and tourist information were rolled out around the capital. About 100 municipal bike stations are scattered around Copenhagen and are relatively easy to use. Independent bicycle hire shops add to the mix, and most hotels have bicycles for their guests to use.

One of the main problems the city faces is the flood of motorists who commute daily to and across the city center from outside Copenhagen, yet do not contribute to taxes covering maintenance of the roads. Moves are being made to deter these motorists and to provide detours. Several roads have had their number of car lanes reduced to provide more pedestrian and cycling space. Others have been closed to motorists and reconfigured to allow only buses, pedestrians and cyclists to pass through.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.5/10**

Motorists can pay for parking at one of the 1,600 solar-powered parking machines or by using a smartphone app that also allows for additional time to be bought easily.

There are four color-coded parking zones in Copenhagen, decreasing in price per zone when moving away from the city center. Outside of these zones are time-restricted parking areas.

Parking spaces started to be removed from central Copenhagen in the 1960s. This has allowed for:

- More pedestrianized/community areas
- Improvement of sight-lines at intersections
- Decreased crossing times for pedestrians by installing bulb-outs (sidewalk expansions at crosswalks)
- Greening the streetscape with tree plantings
- Expansion of the space available to cafes on narrow streets
- Addition of benches to encourage lingering.

Copenhagen has experimented with various *smart-parking* initiatives including multiuse parking spaces in busy areas where a street car park is available only for cyclists to park in from 7:00am to 5:00pm, and between 5:00pm to 7:00am for car parking. A smart parking app is being developed to help motorists to easily find available parking spaces.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

After Singapore, Denmark is the next most expensive country in the world to own a car. Owners are required to pay 150 per cent tax on the purchase. Heavy taxes are also imposed on cars bought outside Denmark and then registered in the country.

There are five car-sharing companies in Copenhagen providing a solution to locals who do not own a car. All companies offer a range of packages, both for once-off and regular use. Drivers can book and pay using either a smartphone app or with their public transport travel card.

With the improvements in public transport and cycling infrastructure, the reduction in space for cars on the road, increased licensing and parking costs and in some areas the loss of up to half the spaces, car usage has steadily declined. However, car ownership has increased especially in newer areas of Copenhagen. The municipalities are regularly discussing and trialing different methods to discourage car ownership and encourage citizens to walk, cycle, use public transport, use car-sharing vehicles or a combination of all these options.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **6.5/10**

Plans for a centralized traffic management system are in development. At present, there are several apps in Copenhagen that aren't well connected but each capture different types of data such as traffic signal failure, accidents, congestion, roadworks and sensors.

The use of autonomous vehicles has been a major area of interest. Since 2016, the Road Directorate has been testing driverless cars in and around Copenhagen and is currently piloting autonomous buses.

TECHNOLOGY
7.7/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

All Danish residents have a social security CPR card that stores their personal data, displaying their full name, address, social security number, and the municipality they belong to, their emergency healthcare phone number, their doctor and the doctor's address. When an individual visits their doctor, all information, specialists' referrals and prescriptions are stored on their CPR card, meaning the pharmacist only needs to scan the social security card.

Most Danes have a digital mailbox linked to their social security number, where all public-sector communications, bank statements and pay slips are sent.

The Danish Government has also implemented an e-government and e-signature system for citizens where, by using their social security number, they can manage their internet banking, make official address changes, file tax returns and make doctors' appointments, and access all their health data all online.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Copenhagen enjoys very fast internet speeds — it is currently at 641.05 Mbps for uploads and 582.70 Mbps for downloads.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

Ninety-eight per cent of Denmark's population has a 4G LTE connection, and in June 5G was rolled out. Mobile broadband is the province of four telcos: TDC, Telia, Telenor and 3. TDC has half of the mobile phone market, and leads in mobile speeds. The fastest mobile speeds are 45.36 Mbps for downloads and 22.30 Mbps for uploads.

With the uptake of smartphones, all pay-phones have been removed from Copenhagen.

OPEN DATA

SCORE: **8.0/10**

The Copenhagen city government contributed CAD830,000 to support the open data platform and the Danish Capital Region contributed CAD1 million to improve open data availability. At least 65 sources of open data on Copenhagen have been pinpointed. By combining available open data, and further linking this with information submitted by businesses and citizens, the platform will enable advanced analytics to support data-driven smart city functions, and further help Copenhagen reach its 2025 carbon-neutral plan.

As a result of a partnership between Hitachi, the City of Copenhagen, the Danish Capital Region, CLEAN (a Danish cleantech cluster organization), and a consortium of partners, the open data platform, The City Data Exchange (CDE), has undergone two years of development.

Both public and private sector organizations have used the CDE to gain insights into data use cases, new external data sources, data protection regulation issues, and to explore the value of their data. Before the CDE was launched, there were only a few options available to purchase or sell data.

The increased emphasis on open public data will inevitably play a decisive role in future Danish Smart City projects because a lot of the data that can be used to create smart solutions is generated in the public sector. Private sector use of public data can generate substantial value. In fact, the business reuse of public data in Denmark alone has been estimated to amount to about CAD120 million a year. Meanwhile, the EU Commission estimates that access to public data on an EU-wide scale is worth CAD42 billion. The great access to public data in Denmark presents a business opportunity for foreign companies wanting to develop new smart city applications.

INFORMATION AND DATA SECURITY

SCORE: **7.0/10**

Copenhagen has recognized the steady increase in digitization and the growing need for improving information and data security by investing CAD310 million in this. The ISO27001 security standard will be applied, and the 2018-2023 Defense Agreement enforced. The government has recently launched 25 initiatives and six targeted strategies addressing the most critical cyber and information security areas, ensuring society can continue to benefit from technological opportunities, and encouraging citizens to retain confidence in digital development.

PLANNING AND POLICY

SCORE: **6.0/10**

Hitachi is building an innovative big data platform for the City of Copenhagen. This citywide marketplace is the first in the world to integrate public and private data into a single solution. It will enable business, academia and the public sector to come together and integrate multiple sources of information to meet the challenges of sustainability and quality of life.

URBAN SYSTEMS
6.4/10

POWER GENERATION AND DISTRIBUTION

SCORE: **3.9/10**

The Danish electricity grid continues to be among the strongest performers in Europe when it comes to security of the supply and cost level. Recent research shows that Danish consumers have access to electricity 99.99 per cent of the time without the burden of high payments to the grid.

About 43 per cent of electricity consumed in Copenhagen is generated by wind turbine, up from only two per cent in 1990. The aim is to reach 50 per cent by 2020.

Renewable energy is on the rise with 70 per cent of renewable energy currently coming from wind power, and 17 per cent from wood fire.

Copenhagen is the first city to digitize energy consumption data in municipal buildings to save energy and plan for efficiency upgrades. Its Smart Grid Strategy combines electricity meters, read on an hourly basis, with variable tariffs and a data hub. It encourages consumers to use energy more efficiently by allowing them to remote-read electricity data and use the power when it is least expensive.

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.5/10**

In Copenhagen, four utility networks are being transformed into state-of-the-art demonstration facilities for Danish leakage management solutions. The goal is to reduce non-revenue water levels to four to six per cent. The LEAKman solution will be implemented on 95 kilometers of main pipes and will cover 4,800 consumers supplied with 1.2 million m^3 of water each year.

Copenhagen Municipality is working with utility companies to install extensive energy and water surveillance systems in all municipal buildings, providing data that can be studied and analyzed from one central platform. Using high-resolution data from smart electricity, heating and water meters, the city can identify leaks in real-time and plan strategic upgrades for inefficient buildings.

The scheme, which has a payback time of six years, is unique in that it combines information from many building management systems on one platform.

In the first quarter of 2018, the system retrieved consumption data from 550 properties and 482 of the municipality's technical facilities. In 2017, the city saved the equivalent of 1,559 tons of CO_2 on electricity and district heating. In the same year, the system helped to reduce water leakage by 5,300 liters an hour. When the system is fully operational by 2020, a saving of about CAD6.1 million a year is expected through improvements to efficiency.

WASTE MANAGEMENT

SCORE: **7.8/10**

As part of its aim to become carbon-neutral by 2025, Copenhagen has steadily decreased how much of its waste ends up in a landfill. At present, it is only two per cent, compared with 40 per cent in 1988. Emphasis on waste reduction and separation of generated waste has helped lower the percentage of waste ending up in a landfill. All households, apartment and office buildings have bins for plastic, paper, cardboard, glass, biodegradables and residual materials. Metal and batteries bins can be requested from the local municipality. If there is no room for these bins, the waste can be taken to local environment stations. On top of this, there are 550 public glass bins throughout Copenhagen for disposal of recyclable glass bottles and containers.

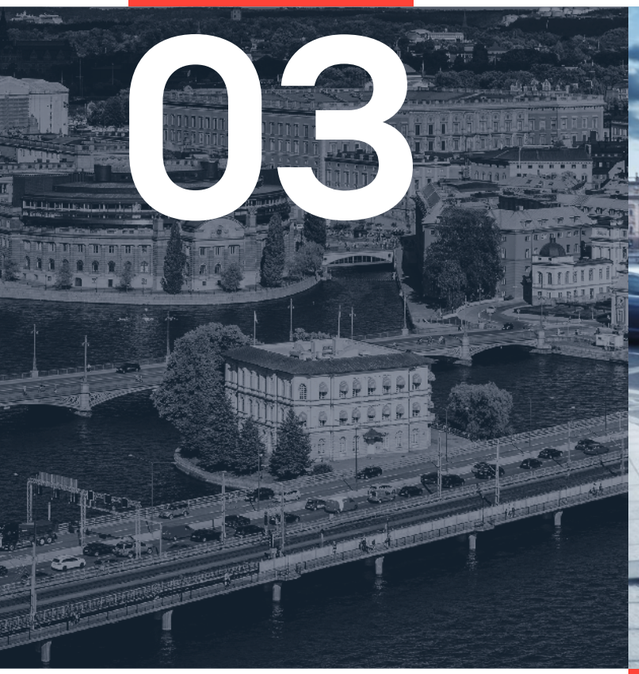
Copenhagen also has a deposit-refund system for most cans, plastic bottles or glass bottles. Most grocery stores are fitted with reversed vending machines, into which people can put cans and bottles and receive a receipt for a refund from the store.

In 2016, all buildings in Copenhagen were provided with organic waste bins, and all households were given small green kitchen baskets and biodegradable bags (for food scraps, coffee grounds and eggshells) to put into the organic waste bins.

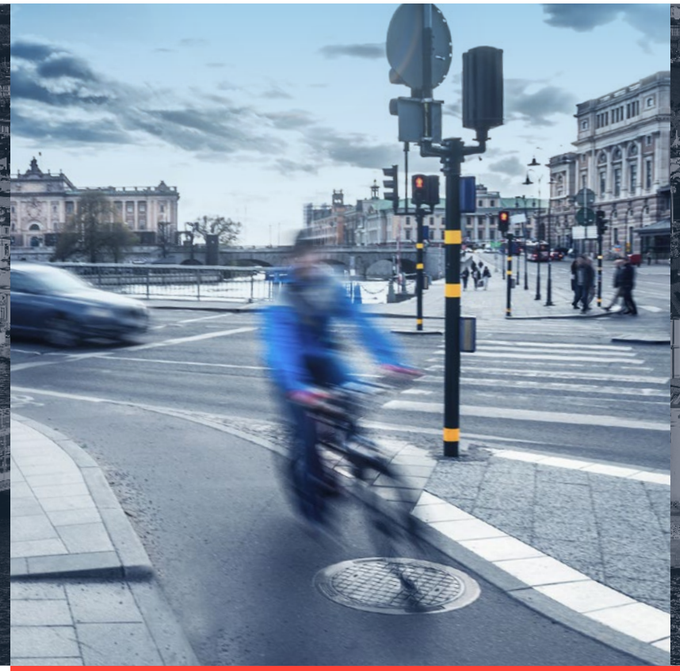
CopenHill, a combined heat and power, waste to energy plant near the city center, is due to open later this year. Its vision is to combine a green waste to energy plant with a recreational area. Inside, the entire energy plant will be in constant operation, converting waste from households and companies to inexpensive, green district heating and electricity for the capital area. The exteriors will be for the public. On the roof slope, citizens will have the opportunity to engage in alpine sports activities, or simply enjoy the view of the city and the façade of the building will be the world's tallest climbing wall.

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03





STOCKHOLM

The city of Stockholm, also known as* The Beauty on Water *because of its location and cobblestone streets, is home to about one million people.

AT A GLANCE

RANKED **03**
CITY SCORE **29.19**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.3/10	**7.4/10**	**8.2/10**	**6.3/10**

The larger, functional commuting area has 2.3 million inhabitants. The city is in an exciting expansion phase and one of the five fastest-growing cities in Europe. The population of greater Stockholm has grown by 20 per cent during the past 10 years with employment growing almost at the same pace (14 per cent). Predominantly, the growth is organic and foreign migration, with assistance from domestic migration.

The population increase requires an expansion of the public transport system as well as homes. The subway system is being expanded, with 11 new stations about to be built. The housing market is equally critical to the city development. Even though the construction of new homes has increased in recent years, the city still faces challenges in expensive sublet rents and few affordable houses for younger people.

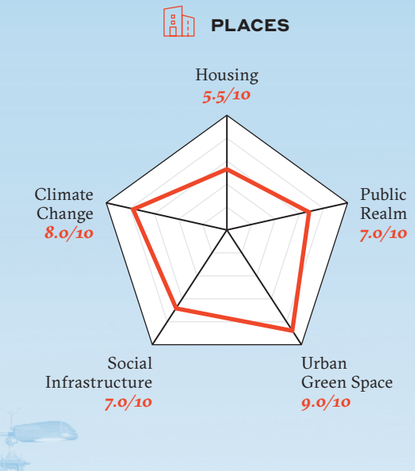
The Stockholm municipality, the most populous municipality in Sweden, is responsible for schools, child and elderly care, care for the disabled, primary healthcare, emergency services, planning of construction and culture. The municipality also has responsibility for streets, roads, water and sewerage and much other technical supply.

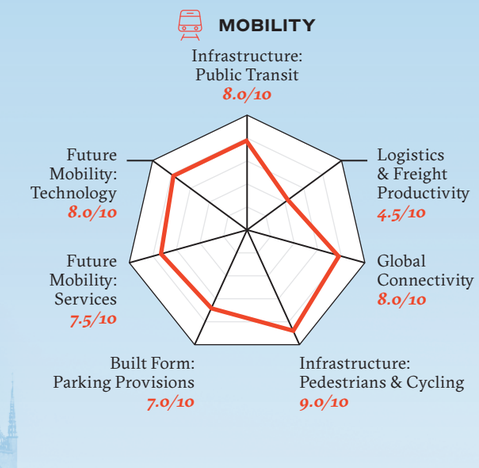
As the city population is growing at a fast pace, there is increased pressure on schools and healthcare. The city has experienced a shortage in teachers and carers for children and the elderly. The need for workers in those sectors must be filled for the city to develop in a positive way.

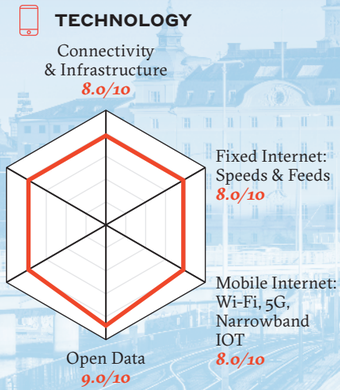
Climate change implies that society will have to adapt to more extreme weather events than today. Flooding and heat waves will become more common in the future. This means housing, infrastructure and technical supply systems must be adapted to meet both today's extreme weather events and the anticipated climate change.

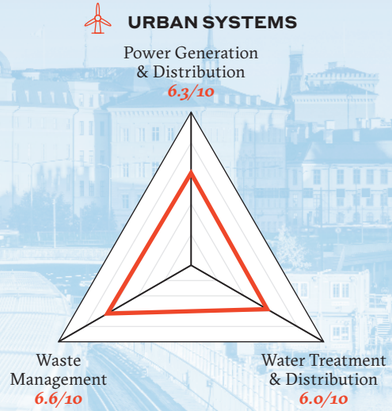
At present, Stockholm is reconstructing Slussen, an important water lock in the city center. The new Slussen is primarily designed to improve the traffic situation at an important junction, but will also be able to release twice the amount of water from Lake Mälaren into the Baltic and thereby reduce the risk of flooding.

CITY ASSESSMENT









PLACES
7.3/10

HOUSING

SCORE: **5.5/10**

Home to a quarter of Sweden's population, Stockholm offers an excellent mixture of livability, stability and innovation, which has made it a destination of choice for Swedes as well as foreign nationals.

Stockholm is one of the fastest-growing regions in Europe, and strong population growth is projected towards 2035. Major construction and redevelopment is under way, and the long-term development plan estimates that 140,000 new residences will be constructed by 2030.

The development plan for the region sets a course for Stockholm to become the most attractive urban region in Europe by the year 2030. The County Council will ratify the next plan, which stretches to 2050, this year.

Because of rapid urban growth, housing has become a significant social challenge. Stockholm regularly ranks among the more expensive cities in Europe.

The housing market in Sweden is highly regulated. About 22 per cent of Stockholm's housing consists of municipality-owned rental units, for which there are long queues because of their affordability. Private rents are equally regulated, and legally prohibited from being a lot higher. Buying is extremely expensive because of the supply and demand, which creates an inflexible housing market and limits access to accommodation. Rents on the secondary market also can be very high, presenting a big obstacle for young people, students, immigrants and people moving from other parts of Sweden and abroad. The housing shortage is a big growth constraint.

The city has set housing targets by region and district in the current development plan, which estimates that 140,000 new homes will be built by 2030. The plan focuses on creating coherent urban growth, tying together districts as well as densifying inner-city areas. Work on big-ticket infrastructure projects, including major extensions to the subway system, is under way.

However, a lack of political will in dealing with the growing strain on the housing market has been exacerbated by strict building regulations. They have further limited investment while ensuring high physical standards for housing. Building regulations also pose a big obstacle to construction of genuinely affordable housing.

PUBLIC REALM

SCORE: **7.0/10**

Stockholm is situated on several islands and its waterfront and public spaces, as well as clean urban environment, are of world renown. It usually ranks among the best cities in the world for natural environment.

Development of a pedestrian-friendly environment is a priority, with a focus on an available public space in the form of squares, parks and streets. Long-term plans include transforming local streets by prioritizing pedestrians, cyclists and public transport, while still retaining their functions for transport of people and goods. Existing freeways and other heavily trafficked areas are to be complemented with crossings to reduce the barriers in the urban landscape. The construction of Bypass Stockholm, rerouting the major freeway past, instead of through, the city will lower traffic flows, promising a better urban environment with less noise and pollution.

The regional development plan recognizes the importance of protecting the region's water quality. Water protection efforts should adhere to the European Union's Water Framework Directive, which sets out rules to halt deterioration in rivers, lakes and groundwater. The plan also stresses the importance of providing long-term protection for undeveloped beaches and coastal areas, as well as ensuring the public availability of these areas for recreational use. Reconstruction of Slussen, a central traffic hub on the outlet between Lake Mälaren and the Baltic Sea, will transform the area, better catering for pedestrians as well as squares and retail properties.

URBAN GREEN SPACE

SCORE: **9.0/10**

The Stockholm municipality is composed of 40 per cent parks and green areas and 70 per cent of residents have a park or green area within 200 meters. Several large preserved natural areas (so-called *green wedges*) are accessible to the public; their preservation as well as integration into the growing urban environment is a priority in the regional development plan.

The plan is supported by a park strategy, which underlines the importance of Stockholm's green profile. Among its key measures is increasing accessibility to parks and green areas, as well as allowing for more, smaller green areas in the increasingly dense urban landscape.

SOCIAL INFRASTRUCTURE

SCORE: **7.0/10**

Sweden has a high-quality public school system giving free access to all levels of education, although scores have dropped in international rankings in recent years. The rapid population growth has increased the demand for all levels of education, which has put pressure on school capacity. However, education is a focus area in the regional development plan, including access to international schools and a greater emphasis on matching education with the demands of the labor market.

The general quality of tertiary education in Stockholm is high, with access to several top-ranking institutions. Research, development and innovation are central parts of the region's job market. To further stimulate innovation, public authorities in the region have begun several initiatives.

Access to healthcare in Sweden, and the Stockholm area, is generally good, with a well-developed public health system. However, recent population growth has increased demand in the Stockholm area, which has caused some capacity problems, in maternity care for example. Although investments have been made to expand healthcare capacity in the Stockholm area, including a recently opened hospital, these have been plagued by cost overruns and operational problems.

Cultural aspects in the regional development plan focus on social cohesion and cultural diversity. Development of a regional culture strategy is in progress. While access to public institutions such as galleries, museums and libraries is good, with a wealth of free alternatives, a focus area in the regional strategies is to make cultural institutions more accessible to young people and in socioeconomically weaker areas.

CLIMATE CHANGE

SCORE: **8.0/10**

Stockholm is a city with elevated risk to climate change, primarily because of its location across the outlet from Lake Mälaren into the Baltic Sea. Flooding is the primary risk facing the greater Stockholm area and could lead to salt water spilling into the lakes that supply the region with fresh water.

Stockholm faces obvious risks from increases in sea level. However, there is a strong institutional capacity to respond to those risks.

Current plans consider estimates of increasing water levels and rain volumes, for example by interspersing new residential areas with green areas to increase retention and drainage, but also by introducing regulation on the minimum elevation of sewage and drain systems to mitigate the risk caused by flooding.

Reconstruction of the main lock covering the inlet to Lake Mälaren will provide resilience to increasing water levels and is estimated to add sufficient protection for projected water level increases for the next 100 years.

Carbon neutrality is a focus area of the regional development plan. Stockholm regularly ranks as one of the greenest cities in the world. The city has adopted a strategy to become fossil-fuel free by 2040, which sets out the path, as well as targets for 2020 and 2030, including a fossil-free municipal organization by 2030. The city council voted to implement a ban on certain fuels in inner-city areas to improve air quality. The ban implementation is expected by 2020.

MOBILITY
7.4/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **8.0/10**

The city is in an exciting development phase in which many parts of the infrastructure system are being rebuilt, including expansion of the subway system with 11 extra stations. Rail transport via the subway remains the backbone of Stockholm's urban infrastructure and helps explain why it has such a high rate of public transport use; about 70 per cent of all journeys are in peak hours. The city has also successfully implemented congestion charging in the city and on major thoroughfares.

The present long-term masterplan (2014-2025) calls for a focus on development of regional infrastructure to improve connections to neighbouring regions. High-speed rail connecting Stockholm to Gothenburg and Malmö is being planned, although financing of the project is problematic. Other capacity-increasing rail and infrastructure projects are under way, such as Bypass Stockholm, which reroutes traffic from the major freeway passing through the city. By 2035, an estimated 140,000 vehicles a day will use the bypass.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **4.5/10**

Stockholm is attractive for both local and foreign business. The freight volumes are heavier than from other parts of the region, which is partly explained by the large population. All goods destined for Stockholm pass some form of relocation to other vehicles or another type of traffic and infrastructure investments have provided Sweden with greater capacity to ensure fast, frequent and timely deliveries. What makes Stockholm different from many other bigger cities is the possibility of transportation on water. However, delivery in the city center can still be difficult and there are no public documents on how logistics should be improved.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

Global infrastructure connections — including freight, aviation, and broadband systems — are high quality. Stockholm Arlanda Airport is being expanded. It is expected to become the leading airport in Scandinavia, handling 40 million passengers a year by 2040. The reconstruction includes increased capacity for travelers, tenants and airlines, as well as for shopping, restaurants, hotels and conference facilities. Stockholm Skavsta Airport, about 100 kilometers south of Stockholm, provides an alternative airport primarily for low-cost airlines.

The ports of Stockholm are important for both local and foreign business. The city is constructing Sweden's new port for rolling goods and containers at Norviksudden outside Nynäshamn. Stockholm Norvik Harbor will become a new logistic hub in the growing Stockholm and Mälardalen region.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **9.0/10**

Stockholm has developed a plan to make the city more pedestrian-friendly as part of its Urban Mobility Strategy. The city traffic council recently adopted a new parking plan, which included new zones and price structures aimed at reducing congestion and increasing parking capacity. It has also adopted a digital parking system to ensure ease of payment and effective utilization of available spaces.

In spring and summer, many Stockholmers travel and commute by bike. The city's overall goal is to increase bicycle traffic from five per cent to 20 per cent of journeys in 2030. To achieve this ambitious goal, a regional cycle plan has been created. The plan includes a review of what should be done and an estimated cost. Part of the plan is for the construction of 850 kilometers of dedicated bicycle paths.

Development of a pedestrian-friendly urban environment is a prioritized area in city planning documents, and long-term plans include prioritizing pedestrians, cyclists and public transport in local streets.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.0/10**

Parking availability is crucial for car ownership. The policy in Stockholm is designed to encourage people not to have a car, at least not in the city center, so that the streets are less congested and better for pedestrians. This year the city introduced fees in new areas and the time and charges changed to discourage those seeking parking.

There are two main parking options in Stockholm: a monthly payment that allows you to park your car wherever you find space and a payment for parking at a certain spot for a limited time, either on the street or in a parking garage. Parking is expensive and infringement fines for not having a valid ticket are steep, especially in the city center.

FUTURE MOBILITY: SERVICES

SCORE: **7.5/10**

Cycle-sharing is growing fast. You can either borrow a bike for a single trip or buy a bike pass that allows you to hire a bike for longer. Several stations around the city enable people to hire a bike whenever they need it.

Car-sharing is also a growing industry with several companies active in Stockholm. As well as taking more cars off the roads, it is also a cheap alternative for those who only want a car for single occasions.

Point-to-point and on-demand services are also on the move. There are several alternatives for individuals and companies to order fast and personal delivery of an array of goods and services. Examples include Foodora and Uber eats in the food delivery market, Ryska Posten in the goods and services market and Bzzt for fast and environmental inner-city transport. The market is limited to the city center.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **8.0/10**

Stockholm will be a world leader in allowing electric vehicles to recharge as they drive. The project is called eRoad Arlanda and is part of the route between Arlanda Cargo Terminal and Rosersberg logistics area. The track is primarily planned to be used by 18-ton trucks delivering goods for a postal office.

The number of electrical cars in Stockholm is increasing as well as the charging infrastructure. Several moves have been made to promote electrification, among them the Vattenfall AB *inCharge* initiative in collaboration with several companies to make electrical vehicles charging more publicly available. The City Council has voted to implement a ban, expected to be implemented in 2020, on certain fuels in inner-city areas to improve air quality.

The major bus distributor of public transport in Stockholm, SL, is investigating the possibility of most of their fleet becoming electric. This option could be done in 2026 when the current traffic agreement will be renegotiated.

TECHNOLOGY
8.2/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Many information and communication companies, start-ups together with well-known multinationals, have been established in Stockholm, which indicates the huge potential of digital infrastructure in the city. In 2017, the Stockholm City Council adopted a strategy to further develop a *smart city* through coordination of the city's work on digitalization. The strategy has been developed together with Stockholm's citizens and includes the expansion of digital public services and construction of digital infrastructure.

In 2016, the city of Stockholm invited start-ups, entrepreneurs, students and citizens to the Open Stockholm Award. The idea was to make Stockholm smarter for residents and visitors. The award was shared by two mobile applications, Asthma Watch and Stockholm Garden.

Asthma Watch helps asthmatics in Stockholm to avoid areas with high particulate levels in the air. Stockholm Garden connects Stockholmers interested in horticulture with people interested in renting a small piece of their cultivation plot or residential area.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Broadband is fast becoming the most common type of internet in Sweden, connected to a person's home via fiber optic cables. Connection speeds in Sweden are fast in comparison to many other places in the world. The Swedish Government has adopted a broadband strategy that aims at 95 per cent of the country having high-speed connections by 2020, and 100 per cent by 2025. The strategy also focuses on increasing speed and access to mobile connectivity. The Stockholm region has adopted a strategy to achieve this, which includes concrete goals for 2020, as well as allocation of regional and state funds for the purpose.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **8.0/10**

Smart phones with internet included in the contract are by far the most commonly used in Stockholm. The internet connection is good in most places and does not differ much between operators. However, it can be difficult for a non-Swedish citizen to get a contract that includes internet as it often requires a Swedish bank account.

For those that cannot access internet through their phones, Wi-Fi is offered (either for free or at a low cost) in many public areas such as shopping centers, cafes, restaurants and some public transport locations. Wi-Fi offered in public spaces is usually not as fast as that offered in phone contracts.

OPEN DATA

SCORE: **9.0/10**

Sweden has a long history of public access to official records dating back to 1766. It also has a wealth of statistics and data freely available through public agencies. There is an ongoing effort to make open data and public sector information available through the European Data Portal. The City of Stockholm started to publish open data in 2011.

On its website, six categories of open data can be found, including culture, demography, traffic, environment, public services and geographic.

The Open Stockholm Award winners Asthma Watch and Stockholm Garden are a good example of how open data has been used successfully.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

Sweden is one of the most well-connected countries in the world, with more than 95 per cent of the population having access to the internet. With ever-growing online activity, reported instances of cybercrime are rising. A recent Symantec survey estimated that in 2016, every fifth Swede was exposed to some form of cybercrime, resulting in total annual losses of almost CAD400 million. Likewise, the National Defense Radio Establishment said there were tens of thousands of harmful code activities against Swedish entities each month.

To adapt to this development, and to comply with the EU Directive on security of network and information systems, NIS (2016/1148), the Swedish Government launched a national strategy for cyber security in June 2017. The strategy highlights six areas of priority:

1. Securing a systematic and comprehensive approach in cyber security efforts
2. Enhancing network, product and system security
3. Enhancing capability to prevent, detect and manage cyberattacks and other IT incidents
4. Increasing the possibility of preventing and combating cybercrime
5. Increasing knowledge and promoting expertise
6. Enhancing international cooperation.

PLANNING AND POLICY

SCORE: **8.0/10**

It is not easy for policy makers and public planners to keep up with digitalization. However, Stockholm's documented digital strategy, including the ambition of open data as well as strategy for data security, indicates the city is planning for a digital future. The city council is encouraging citizens to be part of the transformation (i.e. Open Data Award).

URBAN SYSTEMS
6.3/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.3/10**

About 80 per cent of the energy used for heating in Stockholm comes from district heating (hot water through insulated pipes), and 15 per cent from electricity. The city's energy consumption remains unchanged, even though the population is increasing.

More efficient energy usage and renewable energy sources are needed to reduce the greenhouse effect. As well as replacing fossil fuel energy with renewable energy, energy efficiency needs to be improved.

Stockholm has developed a climate and energy strategy as well as a strategy for a fossil-fuel free city by 2040 to reduce the city's environmental impact. For energy efficiency in buildings, the goal is to make energy consumption 20 per cent more efficient in 2020 compared to 2008. For energy production, the goal is to lower energy-related emissions by 30 per cent per citizen in 2020 compared to 2005 and by 40 per cent in 2030.

Much of the efforts in the climate and energy strategy are in line with the strategy for a fossil fuel-free city in 2040. To achieve this aim, the city is working with energy companies, hospitals and others to gradually replace fossil oils with renewable energy.

WATER TREATMENT AND DISTRIBUTION

SCORE: **6.0/10**

The biggest environmental problems in Stockholm's lakes, waterways and coastal waters are eutrophication, environmental toxins and physical interventions.

The regional development plan points to the importance of protecting the region's water areas by adhering to the European Union's Water Framework Directive, which sets out rules to halt deterioration of water in rivers, lakes and the ground. The new overall target for the water management within the city is that the lakes, coastal water and streams reach the environmental targets for water — in most cases good ecological and chemical status — by 2021 or 2027.

The current reconstruction of the Slussen, a central traffic hub on the outlet between Lake Mälaren and the Baltic Sea, will lower the risk of flooding as well as create a source of drinking water.

Even though water quality has been improved considerably, work remains before the environment quality standard is met. To achieve and maintain good chemical and ecological water status, the city has much work to do.

WASTE MANAGEMENT

SCORE: **6.6/10**

In Stockholm, material recycling and the collection of food waste has increased. The proportion of Stockholmers who dispose of their hazardous waste for recycling has increased while incorrect sorting has decreased. Likewise, the amount of waste put into landfills is decreasing, down to less than three per cent of all collected waste. Plastic is still a challenge, much of it burned rather than recycled.

The city has adopted a waste management plan in planning new areas, reviewing building permits and supervising environmentally hazardous activity, as well as determining how residents, businesses and other organizations should manage their waste.





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04

NEW YORK



New York is the largest city in the United States and an international center of the arts, communication, business services, finance, education and, increasingly, technology. More than 60 million tourists visit each year. The city is thriving by conventional economic measures.

Its population has grown 5.5 per cent since 2010 to a record high of 8.6 million in 2017. Employment has steadily grown since the recession of 2008 to the highest level on record, 4.4 million. Unemployment is at its lowest level in more than 40 years. Median household income increased by 25 per cent from 2006 to 2016 to CAD78,114.

The city has many basic strengths, including good public infrastructure. The public transit system serves 55 per cent of commuters (compared with 4.9 per cent nationally). As a result, the city has the highest percentage of car-free households of any US city. The 12,140 hectares of public parks occupy 14 per cent of the land in the city. Underground aqueducts bring a high-quality water supply from the Catskill Mountains. The New York City Housing Authority owns 176,000 low-income housing units (8 per cent of the city inventory). However, much of this infrastructure was built more than 50 years ago.

Some city agencies have an impressive record of innovation and accomplishment. The crime rate, for example, has steadily declined since 1990 to the lowest level since reliable records have been kept.

Although New York scores well on these measures, it remains a city of haves and have-nots. The poverty rate has held steady around 19 to 21 per cent for the past 40 years. The cost of housing and homelessness has risen. Repeated efforts to improve public education have not achieved the desired results.

Superstorm Sandy caused about CAD78 billion in damage from flooding in the New York City region in 2012. It highlighted a vulnerability to sea level rise and storm surge that will grow more acute.

In the past decade, the city has produced two plans that seek to prepare for the future and introduce new measures that go beyond traditional economic indicators. The first, issued in 2007, PlaNYC, set three main objectives: prepare for an increase in population of one million over two decades, repair aging infrastructure and reduce carbon emissions by 30 per cent. OneNYC, issued in 2015, set four goals: economic growth, equality (less poverty), sustainability and resiliency.

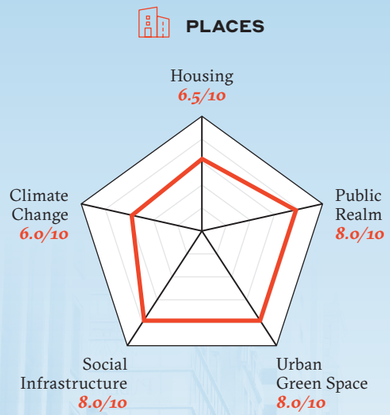
So far planning efforts have not led to adequate funding and implementation. The problems are particularly serious in transport infrastructure, where the approach of making the most of investments by earlier generations is no longer working. Efforts to address the exposure to sea level rise and storm surge have been undertaken at a local, rather than a regional level and may not be sufficiently comprehensive, especially if more pessimistic long-term forecasts prove correct.

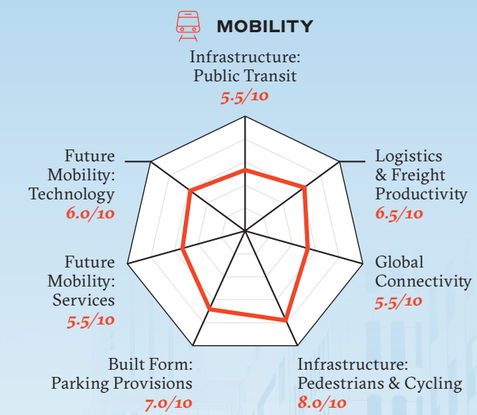
AT A GLANCE

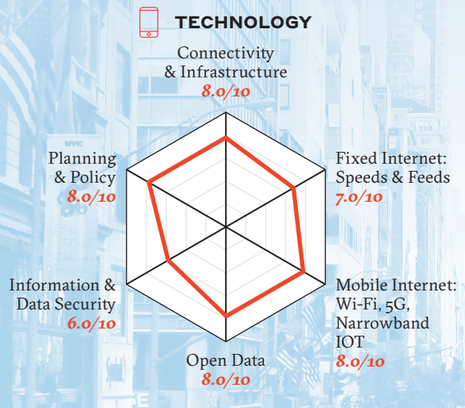
RANKED **04**
CITY SCORE **28.59**

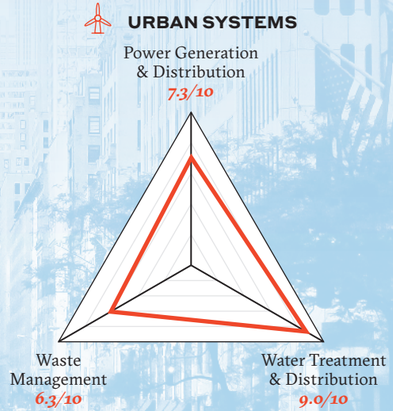
PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.3/10	**6.3/10**	**7.5/10**	**7.5/10**

CITY ASSESSMENT









PLACES
7.3/10

HOUSING

SCORE: **6.5/10**

New York has a plan to build and preserve 300,000 units of affordable housing between 2014 and 2026. The New York City Department of City Planning has mandated an affordable housing component (typically 20 to 30 per cent) for residential developments requiring discretionary approval.

Despite these efforts, in the past seven years an annual average of 15,000 new housing units have been completed while the population has grown by more than 60,000 each year. Supply is not keeping up with demand. The residential vacancy rate is down to 3.6 per cent.

The New York City Housing Authority faces a massive challenge in maintaining aging apartment buildings that require an estimated CAD32.5 billion in repairs, reflecting reductions in federal assistance and many years of under-investment.

There is a growing mismatch between the rate of new residential construction and the cost of housing, and the rapidly growing population and the ability of many residents to pay market rents. Homelessness is on the rise. Although the city has developed plans, incorporated affordable housing requirements into the land-use approval process and invested money, housing affordability remains an intractable problem. Ironically, the overall economic health and growth of the city has undercut these efforts.

PUBLIC REALM

SCORE: **8.0/10**

New York City has invested heavily in parks and public spaces and has steadily dedicated more street space to pedestrians and bicycles.

Many miles of waterfront areas that had been devoted to port and industrial uses have been converted to parks and walkways. These include the Hudson and East River waterfronts, Governors Island and the Gateway National Park. The High Line Park, built on an unused elevated freight rail line, has established a new standard for innovation in park design. The massive Fresh Kills Landfill is becoming a park.

URBAN GREEN SPACE

SCORE: **8.0/10**

In the past 10 years, the city has planted more than a million trees in its parks, on its streets and on private land, increasing its urban forest area by more than 20 per cent. These trees provide several benefits, including improving air quality, reducing urban temperatures, and sequestering carbon dioxide, while also mitigating stormwater runoff.

In addition, New York's 2010 Green Infrastructure Plan has resulted in the construction of more than 4,000 green infrastructure assets, including rain gardens (bio-swales) and green roofs, which has reduced stormwater runoff and combined sewer overflow events.

SOCIAL INFRASTRUCTURE

SCORE: **8.0/10**

Ensuring adequate social infrastructure to support New York's educational and healthcare needs presents ever-changing problems. Although home to some of the world's leading universities and healthcare facilities, providing equitable education and healthcare for all New Yorkers is always a challenge.

One of the city's largest educational successes was the introduction of one year of pre-kindergarten to public schools, which is proposed to be expanded to two years.

The city provides support to many private educational institutions and has given funds and land for the new Cornell-Technion engineering school. In addition, the city provides funding support to its many cultural institutions.

CLIMATE CHANGE

SCORE: **6.0/10**

In the past decade, New York has emerged as a global leader in efforts to pinpoint climate risk and implement policies to reduce the city's contributions to Global Greenhouse Gas (GHG) emission levels. In 2008, the New York City Panel on Climate Change developed projections of climate change effects that have been used to assess the vulnerability of the city's infrastructure assets. In addition, the city has developed a plan to reduce its GHG emissions by more than 90 per cent below 2005 levels by 2050, becoming one of the first global mega-cities to develop such an ambitious plan.

As a coastal city, New York is particularly vulnerable to the effects of climate change. Current projections for 2100 are for a high probability of a one-meter sea level rise and about a 10 per cent chance of a two-meter rise. There is potential for a storm surge of considerably more meters on top of the sea level rise.

Despite the devastating destruction of Superstorm Sandy (a surge of almost three meters at the southern tip of Manhattan), the city does not have an effective strategy to protect the 870 kilometers of coastline in the harbor against the storm surges expected at the end of the century. The city's approach is to build a perimeter protection along the shoreline. Plans are in development for southern Manhattan, Red Hook, Staten Island and other neighbourhoods, but the feasibility of building such barriers, which by the end of the century would likely need to be six or more meters tall, is uncertain. The required funding is not in place.

New York is one of the most vulnerable big cities in the USA to sea level rise and storm surge. The number of people and the value of the assets exposed to potential inundation in the long term make addressing this problem perhaps the top priority in preparing for the future.

MOBILITY
6.3/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **5.5/10**

New York has extensive subway and commuter rail systems that attract greater patronage than other US cities. The system was largely put in place more than half a century ago. It has not been expanded enough to meet a growing population and is starting to show its age. After years of increases, subway and bus ridership has declined and the quality of service (measured by travel times, frequency of outages, and on-time performance) has deteriorated. Extended closures of rail lines to make repairs have become a fact of life. Flooding from Superstorm Sandy and other weather events have added to the disruptions and reduced the reliability of service.

This year, the Metropolitan Transportation Authority (MTA) released its Fast Forward plan, which calls for replacing the subway signal system, which dates back 100 years on some lines, to increase both the frequency and reliability of the service, and taking a comprehensive look at the bus service.

The MTA has extended the No. seven subway line to service a dense new office and residential district on the West Side of Manhattan and recently opened the first segment of a new Second Avenue Subway line. These are significant steps forward but fall short of the expansion in capacity needed.

New York State is expanding Penn Station, the busiest station in the US, into the landmark Farley Post Office which will become Moynihan Station. The railroads have not agreed on a plan for increasing the track and platform capacity at the overcrowded station. Plans for a new rail tunnel under the Hudson River — the first since the early twentieth century — have been developed but funding is not in place.

The region has multiple transit agencies that serve portions of three states. They have yet to agree on an integrated fare payment system.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.5/10**

The Port Authority of New York and New Jersey's container port facilities are the busiest in the eastern US and the volume of freight has been growing. There is capacity to accommodate the increasingly large container ships, which can access the ports now that the ship channels have been dredged and the roadbed of the Bayonne Bridge raised. Many of the terminals are served by rail. A port masterplan is nearing completion that will establish a strategy for moving ahead.

The Port Authority has prepared a regional goods movement plan that provides a framework for all government jurisdictions in the region to address growing freight volumes.

Rail freight access to the city is extremely limited. It is not clear that enhancing freight rail service into the city will be achieved, given the capital and operating costs, the nature of the freight travelling in and out, and the constraints of the existing infrastructure. There are no separate, dedicated routes for trucks in the city.

New York airports continue to be leaders in the quantity and value of air freight.

GLOBAL CONNECTIVITY

SCORE: **5.5/10**

The Port Authority of New York and New Jersey operates three airports in the New York metropolitan area; LaGuardia and JFK in New York and Newark International in New Jersey.

The airports service a multitude of destinations but are notorious for flight delays and do not provide the quality of service and amenity found in other world-class cities. Vice President Biden famously described LaGuardia Airport as a Third World experience. Newark International is the only airport providing one-seat rail access to Manhattan.

Moves have begun to substantially rebuild LaGuardia, replace a major terminal at Newark International and provide better rail access. The funding to bring JFK and Newark up to date is not in place. A Port Authority study has established that it will be necessary to build at least one additional runway to meet growing demand.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **8.0/10**

The city has almost 200 kilometers of bicycle lanes. The Citi Bike sharing system has 750 stations and 12,000 bicycles, and is continuously expanding its footprint and ridership. During temperate months, the number of daily Citi Bike trips regularly tops 70,000. The number of bicycle injuries and fatalities per kilometer of cycling has steadily declined since 2000.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.0/10**

Parking demand has declined in the central business district and at the airports. The rapid growth of for-hire vehicles using app-based technology and a decline in cars entering the central business district (between 2006 and 2016) have contributed to the decline in demand for parking.

FUTURE MOBILITY: SERVICES

SCORE: **5.5/10**

New York has more than 100,000 for-hire vehicles, including more than 50,000 vehicles providing app-based service through Transportation Network Companies (TNC). The number of these vehicles has doubled in the past few years and this year the city imposed an interim cap on any further increases. As a result, New Yorkers have access to a wide variety of price-competitive on-demand and ride-share services. The private sector also offers car rental for short periods of time. The proliferation of TNC vehicles has resulted in increased congestion in the central business districts.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **6.0/10**

In the past few years the city's Department of Transportation has been conducting a Connected Vehicle Pilot program, in conjunction with the US Department of Transportation Intelligent Transportation Systems Joint Program Office, to deploy, test and activate mobile and roadside technologies and enable multiple connected vehicle applications. The pilot is focused on developing and deploying more than 15 safety applications to provide in-vehicle warnings to motorists behind the wheel. The pilot involves installing Vehicle to Vehicle technology in up to 8,000 vehicles, including cars, taxis, trucks, pick-up trucks and buses, as well as infrastructure as part of the Vehicle to Infrastructure (V2I) portion of the pilot throughout Midtown. This includes upgrading traffic signals with V2I technology along several bridges, highways, avenues and cross streets.

For the past decade, there have been repeated efforts to introduce congestion pricing to the Manhattan central business district. On two occasions, cordon pricing proposals, modeled on the systems in London, Stockholm and Singapore, have failed to pass in the state legislature.

New York State is supporting an effort to test autonomous vehicles in the city in 2018.

One goal is for all vehicles sold in the city to be plug-ins by 2025. The city plans to accelerate this shift to electric vehicles by investing CAD13 million in the installation of 50 fast-charging hubs across the city by 2020.

TECHNOLOGY
7.5/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

The city has taken big steps towards building its connectivity, creating new positions focused on telecommunications infrastructure and policy, and establishing the Broadband Task Force.

It is estimated that New York accounts for about three per cent of the world's web traffic, even though it is home to only 0.1 per cent of the world's population. At present 22 per cent of city households lack broadband internet at home. Affordability of internet services is cited as the main barrier to broadband adoption in New York. Thirty-six per cent of households below the poverty line do not have internet access at home, twice the rate of households living above it.

Under the OneNYC 2018 report, the city plans to provide affordable, reliable, high-speed broadband service to every resident and business by 2025. The city will conduct research on the latest broadband developments and trends to help inform the city's strategy on connectivity.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **7.0/10**

New York is a competitive market when it comes to broadband coverage in the US. With 59 per cent of the population covered by 72 fiber providers, the city ranks fourth in the country. Its gaps in broadband choice are still troubling. The city has strengthened its regulatory powers and developed a stronger relationship with telecommunications through continuing implementation of Connect NYC Fiber Access to create broadband redundancy.

The average download speed in New York is 49.19 Mbps. This is 28 per cent faster than the national average.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **8.0/10**

New York and CityBridge, a NYC-based consortium, brought LinkNYC, a first-of-its-kind communications network that will replace more than 7,500 pay phones across the five boroughs with new structures called Links. Each Link provides fast, free public Wi-Fi, phone calls, device charging and a tablet for access to city services, maps and directions.

OPEN DATA

SCORE: **8.0/10**

The City of New York, New York State and the Federal Government all have free websites containing published government data that are accessible to any citizen who can get online. NYC Open Data makes the wealth of public data generated by various city agencies and other city organizations available for public use. As part of an initiative to improve the accessibility, transparency and accountability of the city government, this catalog offers access to a repository of government-produced, machine-readable data sets.

INFORMATION AND DATA SECURITY

SCORE: **6.0/10**

New York is making progress on data privacy and protecting valuable assets online. The mayor has appointed the city's first Chief Privacy Officer, a position created to enhance and coordinate responsible citywide data-sharing practices and to further improve how the city uses data to inform responsible, equitable policies. New York is creating a Citywide Data Integration legal framework that will establish a governance structure and the data security protocols required when agencies exchange data in multiagency initiatives to benefit citizens.

PLANNING AND POLICY

SCORE: **8.0/10**

The city has taken big steps towards building its capacity, creating positions focused on telecommunications infrastructure and policy, and establishing the Broadband Task Force, an advisory body of experts in broadband technology, real estate development, venture capital and digital equity.

The aim is to create new franchises or enlarge existing ones and embrace alternative service models to expand infrastructure, produce more competition, and increase affordability by 2025. Investment will go into providing high-speed residential access either free or at low cost for low income communities.

The city also plans to expand the LinkNYC network. It has called for innovative ways of targeting the needs of under-served residential and commercial customers, perhaps by leveraging public and private infrastructure.

URBAN SYSTEMS
7.5/10

POWER GENERATION AND DISTRIBUTION

SCORE: **7.3/10**

New York's power supply is among the least carbon-intensive in the US, with nuclear and hydro generation accounting for half its needs. Although distributed generation resources are growing, the city does not control the grid generation assets. The official goal is to achieve 50 per cent renewable energy by 2030.

Con Edison serves the private market, and New York Power Authority has a role in suppling public-sector buildings. The city and Con Edison have supported state-level initiatives to improve energy efficiency, increase renewable energy and reduce GHG emissions.

However, New York has a very dense core, especially Manhattan and Brooklyn. Electricity must be imported to these core areas and, if generated locally, cannot take up a large footprint. Solar power is simply too diffused to service the needs of big high-rise buildings, even if every rooftop is covered.

Offshore wind is a nascent technology that will be a major contributor to New York's power grid in the future. The offshore wind leases are handled by the US Government and bids are being managed by the New York State Energy Research and Development Authority.

New York and Con Edison are leaders in smart grid infrastructure. By 2022, five million more smart meters will be installed. Con Edison has many time-of-use rates that support smart grid technology investments. Because of historically high energy prices, demand management has been a business in New York for longer than most areas of the country.

Private investors are working to install energy storage technologies behind the meter to support load shifting and ancillary electric services.

The city and Con Edison are also leaders in supporting emerging energy generation technologies. Con Edison, pushed by the New York State Public Service Commission, enacted a first-in-the-country process of soliciting Non-Wires Alternatives (NWA) to the Brownsville substation upgrades. The NWA process seeks alternatives to costly substation upgrades and has been replicated for all big upgrades.

New York State has been working on a comprehensive process of regulatory reform called Reforming the Energy Vision or NY REV. The city and Con Edison have been working within that framework to allow new business model innovation, although the process has been criticized for taking too long and being too comprehensive. On-site power generation has been increasing at an exponential rate.

WATER TREATMENT AND DISTRIBUTION

SCORE: **9.0/10**

The New York water supply system is one of the most complex and sophisticated in the world. Almost entirely gravity fed, it supplies the city with almost four trillion liters of water daily, drawn from a watershed hundreds of kilometers away in the Catskill Mountains. The city has invested heavily to preserve land in the watershed, preventing development that could affect water quality.

The city is in the process of developing an energy master plan for its water supply and wastewater treatment system, designed to be a zero-net energy system through the use of biogas and other strategies. In addition, the city's green infrastructure planning requirements help to avoid the release of untreated sewage due to combined sewer overflow events during storms.



WASTE MANAGEMENT

SCORE: **6.3/10**

New York has set an ambitious goal of achieving zero waste sent to landfills by 2030, eliminating the need to send its waste to out-of-state landfills and minimizing the environmental impact of solid waste management practices. The city has robust commercial and residential recycling requirements. It has invested in infrastructure to expand these efforts and plans to introduce single-stream recycling by 2020.

There are no active landfills within the city. The last — Fresh Kills, one of the world's largest — was closed in 2001. All six of the city's former landfills are actively managed and Fresh Kills is being converted into an 890-hectare park — almost three times as large as Central Park.

The city also has expanded its organics efforts, collecting food scraps, food-soiled paper and yard waste for composting, thus removing this waste from the city's landfill waste stream. City data reveal a reduction in the waste generation rate of residents and an increase in the amount of electronic waste collected.



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05

Vancouver is situated in the province of British Columbia. Known for its amazing scenery, the city is nestled between the Pacific Ocean and the Coast Mountain range. It boasts the largest port in the country and is the major gateway for Pacific Rim trade.

AT A GLANCE

RANKED **05**
CITY SCORE: **28.56**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
8.2/10	**5.9/10**	**7.8/10**	**6.6/10**

Trade is key to Vancouver's economy, which was built on supplying natural resources such as gold, forestry products and other minerals to the world. Key drivers of the city's impressive growth in recent years have been the booming housing market as well as solid activity in construction, finance, insurance, manufacturing, film production, entertainment and the arts as well as tourism.

Vancouver is one of the most densely populated cities in Canada with an urban landscape characterized by high-rise residential and mixed-use developments, as well as a lack of affordable housing. The city's approach to urban planning originated in the 1950s when the building of towers was encouraged subject to strict guidelines on setbacks and green spaces. The result is a central business district that is highly attractive to both employers and career-makers and takes about 20 minutes to drive around. The success of these dense but livable neighbourhoods has paved the way for the redevelopment of industrial sites around the city.

Sustainability has been high on Vancouver's agenda for some time. The city's Greenest City initiative is designed to address its environmental challenges and stay on the leading edge of urban sustainability.

The vision is to put Vancouver on the path to becoming the greenest city in the world through a set of strategies that include adapting to the effects of climate change, becoming a zero-waste community by 2040 and obtaining 100 per cent of its energy from renewables by 2050.

Ramping up the supply of affordable housing is another key priority announced in late 2017 to sustain the city's diversity, community, longevity and livability. This is being addressed through the Housing Vancouver Strategy, a plan aimed at transforming low-density neighbourhoods by increasing rental, social and ground-oriented housing near future transit hubs and arterials, starting with the Broadway Corridor, Nanaimo Station, 29th Station and Olympic Village. In terms of infrastructure spending, there is a commitment to public transit with the Millennium Line's underground Broadway Extension, the new Surrey light rail transit system and an expanded bus service.

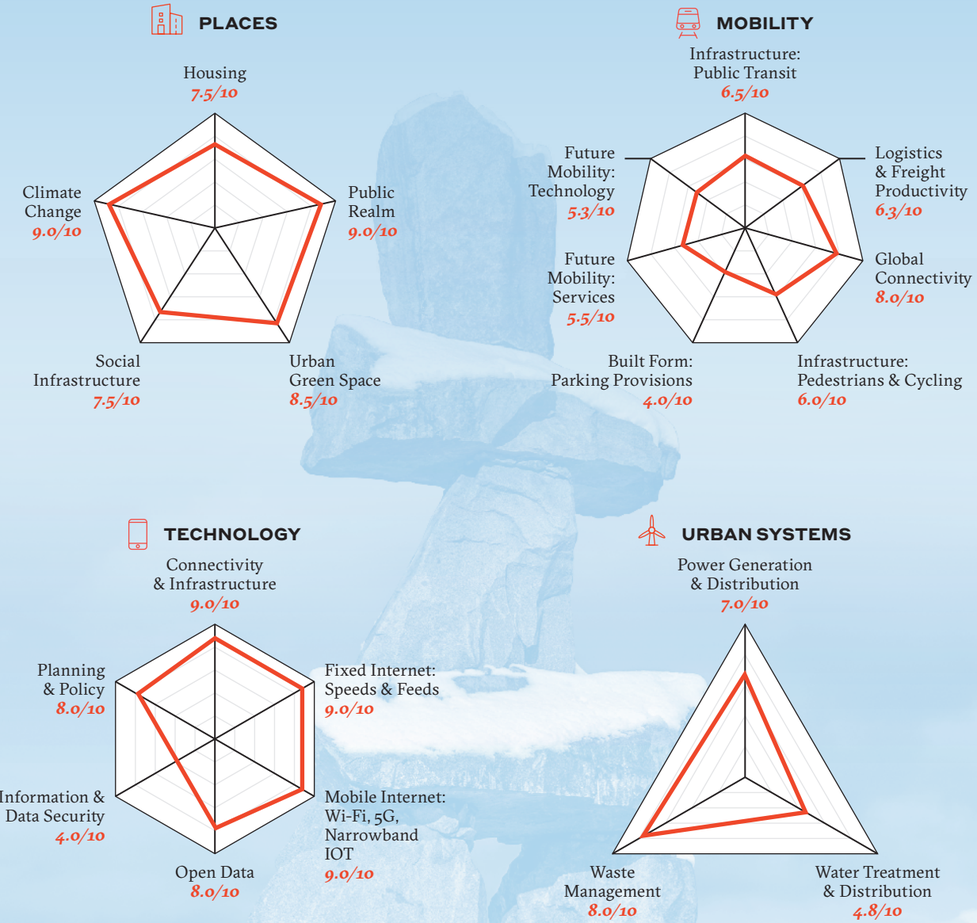
With an aging population, climate change and a geography that constrains this port city, all eyes will be on the outcomes of Vancouver's plans. As with many growing cities, Vancouver will continue to focus on solutions to address housing affordability.







CITY ASSESSMENT



PLACES
8.2/10

HOUSING

SCORE: **7.5/10**

The Metro Vancouver Regional District, Metro Vancouver for short, is a political body governing an area that includes 21 municipalities including the City of Vancouver, the most populous city within the regional boundaries.

The high cost of housing has been a major concern. Recognizing an affordable and diverse housing supply is an important foundation for meeting the needs of a growing population, Metro Vancouver developed a Regional Affordable Housing Strategy. It provides recommended actions for municipal members and other key stakeholders such as the provincial and federal governments, as improving regional housing affordability requires actions from many different actors.

Metro 2040 provides the overall growth management framework for the region and for the Regional Affordable Housing Strategy. It coordinates and aligns regional land use and transportation planning, and directs growth to urban centers and Frequent Transit Development Areas (FTDAs). Other programs are also in place, such as the Metro Vancouver Housing Corporation, a nonprofit organization that provides affordable housing for low and middle income households.

According to the Greenest City target set by the City of Vancouver, the average distance driven per resident will be reduced by 20 per cent from 2007 levels by 2020. The city has also been encouraging compact development in housing. Vancouver's housing target is to build 72,000 units between now and 2027.

PUBLIC REALM

SCORE: **9.0/10**

A well-designed and well-planned public realm plays an important role in facilitating public life and shaping a community. Plazas, publicly accessible urban waterfronts and walkable streetscapes enhance livability and neighbourhood character and, in turn, foster economic growth.

Within the Vancouver metropolitan area, there are several challenges to creating such spaces in the future. The high rate of growth in population density and changing demographics in the region, specifically in urban centers such as the City of Vancouver, create higher demand for open public spaces. At the same time, the pace and volume of densification and the limited supply of viable urban land pose a real threat to the maintenance and expansion of the public realm. In recent years, several public plazas fell foul of development. In response, the regional and local governing bodies have developed strategies and plans to guide the creation of a vibrant public realm.

The Transit-Oriented Communities Design Guidelines were developed by Translink to create more livable places around transit in the Metro Vancouver area. The guidelines address streetscape design by outlining design strategies for multimodal streets and open public spaces such as plazas. With higher building density, the need for active and soft urban edges increases. The City of Vancouver has produced several plans and policies that address planning controls for streetscape design such as the Streetscape Design Guidelines, Street Restoration Manual and the Complete Streets Policy Framework and Related By-Law Changes.

The Places for People Downtown Program was launched to find a long-term strategy for creating vibrant public spaces, including plazas. The city is also working on producing a broad Plaza Stewardship Strategy that would delineate a process for creating, funding and maintaining plazas around the city. Transport 2040 is designed to guide transportation and land-use decisions and public investment for the years ahead. It emphasizes the importance of creating well-designed public spaces.

Vancouver's bustling waterfront is one of the region's greatest assets. In recent years, regional and local municipalities have sought to consolidate economic goals with those of sustainability, resilience and resident wellbeing. The Port Metro Vancouver Land Use Plan outlines a 20-year framework for the development of port lands that is designed to be responsive to business and market needs, while balancing those interests with the protection of the natural and physical environments.

The City of Vancouver released the State of the Waterfront Report in March this year. It sets targets and includes performance indicators for different areas of focus in waterfront development: working, living and access to nature, ecosystems and transportation.

The report seeks to identify risks to sustainable waterfront development such as loss of industrial lands through rezoning, increased containership traffic and an increase in population at risk of flooding.

URBAN GREEN SPACE

SCORE: **8.5/10**

Urban green spaces such as parks, gardens and other ecosystems are a fundamental component of any urban ecosystem and play a critical role in promoting active transportation, recreation and social interaction. The Metro Vancouver 2040: Shaping Our Future is a regional growth strategy that calls for the protection of the environment to respond to climate change impacts, including collaborating across levels of government to protect endangered species and restoring habitats.

The Metro Vancouver Regional Parks Plan outlines goals and strategies for the protection of natural areas and regional parks and encourages engagement with municipality members and First Nations for developing and upholding natural heritage protection plans and policies. The Transit-Oriented Communities Guidelines also stresses the importance of streets, trees and landscaping.

The City of Vancouver's The Greenest City Action Plan is an ambitious document that emphasizes the protection of green spaces and access to urban forests. A Street Tree Guidelines for the Public Realm was also developed to help with preserving and integrating trees into street design with other urban design elements. Plans for protecting conservation areas and enhancing biodiversity within the city are outlined in the Strategic Directions for Biodiversity Conservation and the Urban Forest Strategy.

SOCIAL INFRASTRUCTURE

SCORE: **7.5/10**

Social infrastructure has a key role in creating a sustainable community that maintains and improves the standard of living and quality of life. Many policies and plans are in place to invest in the assets for education, healthcare, childcare systems and public institutions within Metro Vancouver.

The Government of British Columbia (BC) has addressed the increasing enrolment in primary and secondary schools in growth districts in its 2018 budget. The Ministry of Education has been allocated CAD400 million to reduce class sizes and hire 3,700 more teachers to accommodate the growing enrolment. Overall, CAD2 billion is being allocated in capital investments to maintain, replace, renovate, and expand primary and secondary facilities. In Vancouver alone, more than 2,300 student spaces will be added because of capital investments such as the replacement of Bayview Elementary and an additional 200,655 and 1,500 student spaces at Handsworth Secondary School (200), Edgewood Drive Elementary (655) and Salish Secondary School (1500).

While these investments are helping to move the city of Vancouver forward in the primary and secondary education space, enrolment growth projections suggest that more funding will be required to keep up with the increasing trend. The government has also committed CAD2.6 billion in post-secondary capital investments across the province; a large slice is going towards renovations, extensions and the construction of new buildings in many of Vancouver's universities and colleges to accommodate increasing enrolment rates, for example:

- CAD56 million is going to redevelopment, renovation and refurbishment of undergraduate life sciences laboratories at the University of British Columbia
- CAD95 million to building Simon Fraser University's sustainable energy and environmental engineering building
- CAD78 million to the British Columbia Institute of Technology Health Sciences Centre for an advanced simulation building
- 5,000 beds are being added to the student housing program.

To improve its healthcare system, the BC Government has committed CAD3 billion in capital investments across the province in the next few years. The Vancouver region is receiving funding to renew and redevelop some major hospitals to increase access to acute health care. More than CAD1.5 billion has been allocated for big redevelopment projects, including:

- CAD1.3 billion for the three-phase Royal Columbian Hospital redevelopment
- CAD154 million for the redevelopment of the Vancouver Children's and Women's Hospital
- CAD100 million for the Vancouver General Hospital operating room renewal.

As a metropolitan area with a growing population, Vancouver needs more primary care providers and family care centers. The provincial government has allocated CAD150 million over three years to expand coverage. Almost CAD300 million has been granted across the province to fund IT projects that aim to support quality patient care, increase consistency across systems, and establish standardized clinic information systems.

In Vancouver, CAD11 million has been granted to the Vancouver General Hospital Family Health Center to support psychiatric services and community-based health programs. The Burnaby Center for Mental Health and Addictions is being replaced with a new center that will have an additional 105 beds.

Vancouver has some of the highest childcare costs in the province and the country, making childcare inaccessible to many low income families. The BC Government has allocated CAD1 billion in childcare and early learning investments during the next three years to increase accessibility and reduce costs for lower income families. Fee reductions for infant, toddler, and three-to-five-year-old care will help 50,000 families and child care benefits to low and median income families will help 86,000 families.

Increasing the number of spaces is also a priority for the province. There is CAD237 million allocated to increase the number of childcare spots by 22,000. Another focus has been increasing access to specialized care for children with diverse needs and vulnerable children, and providing culturally-centered child are to Indigenous communities.

In the cultural field, the city offers support such as the City of Vancouver Cultural Infrastructure Grants to support cultural space planning, acquisition and development. Examples of new or expanded cultural assets include:

- CAD16 million expansion of the Museum of Surry
- CAD15 million Vancouver Public library expansion.

While there is an Inspiring Libraries, Connecting Communities 2016 Plan, it doesn't mention specific funding or expansion efforts.

CLIMATE CHANGE

SCORE: **9.0/10**

The City of Vancouver's The Greenest City Action Plan is an ambitious strategy for staying on the leading edge of urban sustainability. Through a set of measurable and attainable targets, the city is planning on building a strong local economy with vibrant and inclusive neighbourhoods, and becoming an internationally-recognized city that meets the needs of future generations.

The action plan outlines 10 goals and has three areas of focus: Zero Carbon, Zero Waste and Healthy Ecosystems. Some of the targets are to:

- Reduce community-based greenhouse gas (GHG) emissions by 33 per cent from 2007 levels by 2020
- Require all buildings constructed from 2020 onward to be carbon neutral in operations
- Increase sustainable modes' share of transportation to more than 50 per cent
- Reduce energy use and GHG emissions in existing buildings by 20 per cent over 2007 levels.

The City's Renewable City Strategy sets a goal of obtaining 100 per cent of energy from renewable sources by 2050. The Zero Emissions Building Plan is the next step to advancing the Renewable City Strategy, by eliminating emissions from new buildings by 2030 through energy efficiency and renewable energy. The City of Vancouver is the first big city in North America to establish specific targets and actions to achieve zero emissions in all new buildings by 2030.

In 2012, the city council adopted the Climate Change Adaptation Strategy to ensure a vibrant, livable, and resilient city prevailed. The strategy includes primary and supporting actions, including accountability and priority. Proposed actions were evaluated based on their:

- Effectiveness
- Overlap with sustainability and mitigation goals
- Cost-benefit ratio
- Time horizon for anticipated impacts.

A Neighbourhood Energy Strategy was also developed to build neighbourhood renewable energy systems throughout Vancouver to meet the city's targets in reducing carbon emissions and increasing renewable energy sources to 100 per cent by 2050.

MOBILITY
5.9/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.5/10**

TransLink's Regional Transportation Strategy extending to 2040 is being updated this year. Transportation investments have been established under the 10-Year Vision for Metro Vancouver Transportation. One of the goals of the Regional Growth Strategy: Metro Vancouver 2040 is to directly connect land-use and transportation infrastructure, focusing on creating a compact urban area and supporting sustainable transportation choice. Vancouver has also established a mobility group to explore future transport options and update regional transport strategies.

In March 2018, the government contributed towards a business case study for a high-speed rail line connecting Vancouver, Seattle and Portland. The Compass card was deployed in 2015 as a contactless smart card payment system for public transit in Vancouver. It works for bus, sky train, sea bus, and West Coast Express (a regional commuter train between Mission and Downtown Vancouver). From May 2018, the card readers also accept contactless Visa and MasterCard credit cards, as well as Apple Pay, Google Pay and Samsung Pay.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.3/10**

The Port of Vancouver is Canada's largest, and the third largest in North America by tonnage. It has 27 main terminals with multimodal connectivity for much of the province and Canada. Big infrastructure projects are under way to handle capacity for growth. The Roberts Bank Terminal 2 Project is a new three-berth container terminal that will meet forecast demand to 2030 and beyond. Several studies have revealed that the regional supply of vacant industrial land is declining rapidly, which is expected to have a negative effect on the economy as early as 2020.

The Port of Vancouver mandated GPS units for trucks and has an online GPS dashboard to communicate to traffic terminal condition information. There have also been studies of off-peak goods movement to ease congestion. Last year, a Regional Goods Movement Strategy released by TransLink identified network efficiency as an action to be focused upon. Route separation exists for much of the rail network, and further grade separation is being investigated as part of this strategy.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

Vancouver International Airport's masterplan is updated every 10 years and outlines opportunities for increased global travel and freight by air. Already it handles 24 million passengers annually and in 2012, 2013 and 2014 it was voted in the world's top 10. The masterplan recently received CAD9.1 billion in funding for airport expansion and improvements during the next 20 years that will increase its capacity and number of flight connections, particularly to Asia.

The Port of Vancouver has a Land Use Plan for freight that outlines and guides expansion plans for the next 20 years. It also includes opportunities for global travel as the port oversees cruise operations in and out of Vancouver. Funding for the Port of Vancouver largely comes from private investors and there is substantial interest and revenue being allocated towards expanding port infrastructure for people and goods.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.0/10**

The Regional Cycling Strategy for Metro Vancouver provides guidance on how cycling can contribute to realizing the goals of Transport 2040. Improving pedestrian facilities is also acknowledged in Transport 2040 at a regional level. Many municipalities have plans that address the implementation of shared zones. End-of-trip facilities are addressed by some municipalities and non-governmental organizations, but not by a regional authority.

The City of Vancouver's Transportation 2040 Plan addresses opportunities for lower vehicle speed limits but not specific interventions across municipalities. Some municipal transportation plans provide supporting data for transition to lower speed zones.

BUILT FORM: PARKING PROVISIONS

SCORE: **4.0/10**

Although Metro Vancouver does not have a parking policy for the region, it has released a study about regional parking availability for apartments and opportunities for review. As part of VIVA Vancouver, the city is converting parking spots to parklets for the public to use. Parklets provide places for people to sit, relax and enjoy the city, and contribute to reclaiming public space from traditionally more car-oriented environments such as roads and curbside parking facilities.

FUTURE MOBILITY: SERVICES

SCORE: **5.5/10**

Limited point-to-point services are being supported within Metro Vancouver, including a few regional express transit services that operate to and from ferry terminals in West Vancouver and Delta. The BC Government issued recommendations for ride-hailing for which Uber has provided feedback on. The Transportation Minister is planning on introducing legislation for ride-hailing this northern autumn.

Metro Vancouver provides priority parking spaces at several park-and-ride facilities around the region to support carpooling and ride-sharing. Four car-sharing companies are operating in Vancouver and neighbouring municipalities: Car2go, Evo, Modo, and Zipcar. Car2go and Evo operate a dispersed system in which you can pick up and drop off the car anywhere in the services area, while Modo and Zipcar require you to pick up and drop off the car at the same location.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.3/10**

New mobility policy directions have been crafted for Metro Vancouver by TransLink. The City of Vancouver has acknowledged that this area of study was not well covered in its long-range transportation plan, in part because it was only in early development. Vancouver requires all new houses and developments to provide charging outlets for electric vehicles. As part of Transportation 2040, there is also an action to partner with private industry to provide electric charging infrastructure throughout the city.

At present Unmanned Aerial Vehicles (UAVs) are regulated at a federal level by Transport Canada with limited influence by local municipalities. Companies are in the process of test flights using UAVs for logistics and delivery across the country.

TECHNOLOGY
7.8/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **9.0/10**

Because of the exclusive federal jurisdiction over wired and wireless telecommunications in Canada, Metro Vancouver has a limited role in influencing outcomes. However, the City of Surrey has already been laying the groundwork to thrive in the new age of digital connectivity. By the end of this year, fiber infrastructure will bring broadband speeds to 90 per cent of businesses and homes in Surrey and connect the city to broadband networks eastward across Canada and southwards down the Cascadia Innovation Corridor, all the way to California. The City of Surrey is aiming to become a Metro Vancouver digital service hub.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **9.0/10**

Modern telecommunications services are fundamental to Canada's future economic prosperity, global competitiveness, social development and democratic discourse. Fixed and mobile wireless broadband internet access services are catalysts for innovation and underpin a vibrant, creative, interactive world that connects Canadians across vast distances and with the rest of the world.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

The Canadian Radio-Television and Telecommunications Commission (CRTC) regulates the fiber and wireless companies to ensure Canadians have access to these services. The big three, Rogers, Bell and TELUS, as well as Shaw, Videotron, SaskTel, Freedom Mobile, and Cogeco, have mature networks on fiber and/or mobile, and are continuing to invest heavily in infrastructure developments.

OPEN DATA

SCORE: **8.0/10**

The City of Vancouver has an open data catalog with free and open access to more than 155 datasets. As a component of its Digital Strategy, one of the digital initiatives proposed was to further expand the city's open data platform. However, the strategy would need more funding than presently available.

INFORMATION AND DATA SECURITY

SCORE: **4.0/10**

One of the City of Vancouver's objectives is to, "Advance the technology security and resilience, with a current year focus on enhancing the city's data center redundancy, improving cyber security and assessing mission-critical operational technologies". The Province of BC sees digital security as a shared responsibility and is working to protect and maintain its modernized infrastructure. In 2016, the Office of the Chief Information Officer for the province released an Information Security Policy to outline how it would provide reliable and secure IT services. This policy acts as guidance in the design and operation of safe IT. The Province of BC also has a Freedom of Information and Protection of Privacy Act that the City of Vancouver refers to as a guide to protecting the data and personal information of visitors to its website.

Canada has enacted a Privacy Act to govern the use of all personal information collected by the federal government and the rights Canadian citizens have to access information that has been collected. The federal government also has enacted the Personal Information Protection and Electronic Documents Act to, "Govern the collection, use and disclosure of personal information in a manner that recognizes the right of privacy of individuals with respect to their personal information and the need of organizations to collect, use or disclose personal information for purposes that a reasonable person would consider appropriate in the circumstances."

PLANNING AND POLICY

SCORE: **8.0/10**

The planning and policies for facilitating or commissioning communications infrastructure are regulated on a federal level by the CRTC. The CRTC has a three-year plan that outlines the key activities between 2017 and 2020. Due to the exclusive federal jurisdiction in Canada, Metro Vancouver has a limited role in influencing planning and policies.

URBAN SYSTEMS
6.6/10

POWER GENERATION AND DISTRIBUTION

SCORE: **7.0/10**

With a 100 per cent renewable energy by 2050 target in mind, the city has continued its efforts in expanding district energy networks, intervening on Trans Mountain Pipeline Expansion Project and improving landfill gas capture. One of the priorities until 2020 is to develop four new neighbourhood energy systems, convert two existing steam heat networks to renewable energy and to develop and implement a renewable energy strategy.

The city's Neighbourhood Energy Strategy is another key way to meet the Greenest City 2020 Action Plan and Renewable City Strategy by developing renewable energy systems throughout Metro Vancouver. These systems use low-carbon renewable energy sources, such as sewage waste heat, to reduce the use of fossil fuels.



Vancouver has been focusing on fossil fuel divestment and renewable energy investment for the past five years. The city, as well as the province of BC, has created multiple funding and support opportunities for the generation of clean energy, residential and commercial use of clean energy and the innovation of clean-energy technologies. Programs include Vancouver's Innovative Clean Energy Fund and BC Bioenergy Network funding program. Existing regulatory frameworks are also in place to support such innovation and the Renewable City Strategy, along with other plans and frameworks, aim to support this growth further.

The adoption of smart grid infrastructure is addressed briefly in the Renewable City Strategy. However, set plans and funding for this have not yet been outlined.

WATER TREATMENT AND DISTRIBUTION

SCORE: **4.8/10**

Metro Vancouver is responsible for developing long-range plans for managing the region's drinking water and it regularly reports on statistics and monitoring programs and the progress of implementing these plans. The Drinking Water Management Plan is the overarching plan for Metro Vancouver and its member municipalities that set the direction and priority for drinking water initiatives for the region. It lays out the priority for drinking water initiatives such as: new infrastructure, identifying additional water supplies and managing watersheds as natural assets. The Drinking Water Conservation Plan is also in place to manage demand for the region's drinking water during the summer months, and if required, during an emergency.

Metro Vancouver has continued to invest in water treatment innovation and upgrading, such as a biofuel facility to be built in the City of Surrey to investigate biogas from wastewater. Regulations and policies are also in place to improve receiving water quality by requiring all municipalities to remove one per cent discharge per year.

WASTE MANAGEMENT

SCORE: **8.0/10**

Zero Waste Vancouver is a long-term strategic vision for Vancouver to achieve the goal of zero waste by 2040. This vision helps guide future decisions and investments relating to solid waste and provides a framework to continue the work and success of present waste policies and programs. The Greenest City Action Plan sees a path towards zero waste in reducing solid waste going to landfill and incinerator by 50 per cent from 2008 levels.

The city is exploring short to long-term actions that will help reduce and ultimately eliminate waste sent to landfill or incinerator, including the Single-Use Item Reduction Strategy to reduce waste from disposable cups, plastic and paper shopping bags, foam food packaging, and take-out containers. Vancouver has already instigated a ban on single use straws to work towards the 2040 zero-waste goal.

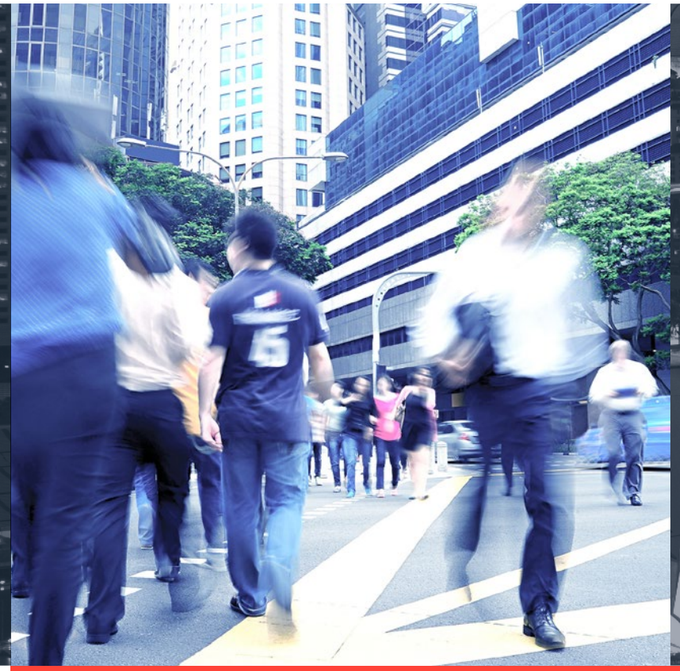
Vancouver has extensive short and long-term plans for minimizing waste (controlling waste generation), separating waste, reusing materials and targeting zero waste. The City of Vancouver produces two annual reports about landfill and overall waste management efforts. Although there is no specific mention of remediation in the annual landfill reports, they do provide an overview of landfill activities.

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06





SINGAPORE

Singapore, affectionately known as the Lion City, is a sovereign city state and island country in Southeast Asia that lies one degree north of the equator. Although Singapore has few natural resources, its focal position and deep-water harbor have helped establish the city as one of the world's busiest hubs for shipping.

AT A GLANCE

RANKED **06**
CITY SCORE: **27.97**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.2/10	**7.4/10**	**7.8/10**	**5.6/10**

Renowned for its prosperity, the city has strict local laws and impeccable cleanliness. Once a British colonial trading post, Singapore is home to an array of cultures, ethnicities and religions. Singapore's resident ethnic makeup comprises of Chinese, Malay, Indian, Eurasian and Peranakan (Straits-born people of Chinese and Malay/Indonesian heritage) communities. While the Constitution enshrines Malay as the national language, the four official languages are English, Mandarin, Malay and Tamil.

Today, Singapore has fostered a highly-developed and successful free-market economy alongside a stable political environment. Economic growth has been underpinned by exports, particularly consumer electronics, information technology products, medical devices, pharmaceuticals as well as robust transportation, business and financial services.

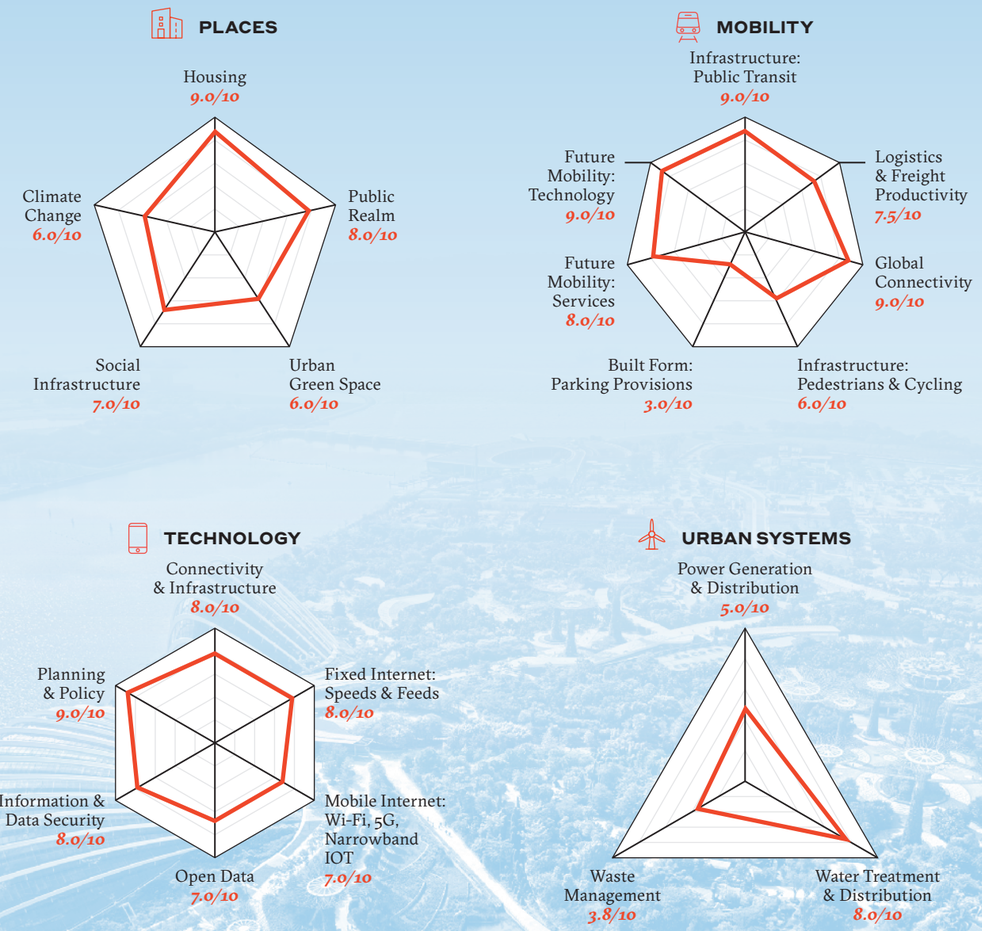
Boasting one of the highest per-capita GDPs in the world, Singapore's education, technology and healthcare ranks highly as does quality of life. Infrastructure is extremely well-developed with 100 per cent of the population having access to electricity, piped water and sanitation.

With a highly-efficient public transport system, the government's next step is merging technology into every aspect of life on the island as it turns Singapore into a Smart Nation. Mobility is viewed as key to the functioning of a livable and sustainable city and trials for driverless and autonomous vehicles are being undertaken.

Half the size of Greater London, Singapore is highly urbanized and densely populated with most of its people living in public housing tower blocks. The city's progress since independence in 1965 has been remarkable. Urban planning is a highly-centralized government function and there are several sophisticated plans that are guiding the city's future, managing the environment, protecting green spaces and ensuring social programs cater to the community's needs.

Singapore has it all — quality of life, sustainability, competitiveness, livability and a great sense of identity.

CITY ASSESSMENT



PLACES
7.2/10

HOUSING

SCORE: **9.0/10**

Far-sighted, holistic and comprehensive planning by the Ministry of National Development has been a constant in the life of Singapore. So, it can confidently consider future development needs through an integrated planning process. The public and stakeholders are consulted throughout the planning process on area-specific plans (such as rail corridors), and development control guidelines.

The Land Use Plan outlines the strategies to sustain a high-quality living environment for a population range of 6.5 to 6.9 million by 2030. It also sets aside land to meet national needs beyond then, so future generations have options and room for growth.

The strategies to sustain a high-quality living environment include:

- Providing good affordable homes with a full range of amenities
- Integrating greenery into the living environment
- Providing greater mobility with enhanced transport connectivity
- Sustaining a vibrant economy with good jobs
- Ensuring room for growth and a good living environment into the future.

Good and affordable housing is a priority in meeting the needs of Singaporeans. The Housing Development Board (HDB) is charged with building affordable homes and transforming towns to create value and quality living; it caters for more than 80 per cent of the population. The board's aim, set out in the January 2013 Land Use Plan, is to build up to 700,000 new homes by 2030 to meet predicted population growth. Of these, almost 200,000 are already in the pipeline. Many of the remaining 500,000 new homes will be in new towns and housing estates, infill sites in existing towns, land freed up by the redevelopment of old estates, and vacant land within and on the fringe of the city center.

The speed of constructing new homes will depend on actual demand. The latest planning concepts and technical innovations, supported by amenities, will be incorporated in new towns and estates. Existing towns will be rejuvenated through various government-funded development programs such as HDB's Remaking Our Heartlands. More housing will be provided in and around the city core to enable more Singaporeans to live nearer to their workplaces and enliven business districts. These homes will have easy access to abundant green and recreational spaces, comprehensive amenities and services for the young and old, and an extensive public transport network, especially train lines.

PUBLIC REALM

SCORE: **8.0/10**

Be they parks, open plazas and shaded atriums, or streets that people use every day, public spaces have a big effect on overall wellbeing. Well-designed public spaces provide relief from the dense urban environment by promoting life outside buildings and the opportunity to foster social and community connections with fellow residents. As the city grows, the Urban Redevelopment Authority (URA) is planning for new public spaces and enlivening existing ones.

While good design enhances the appeal of a place, regular programming actively draws in new and repeat users. Plans to enhance public spaces have always included bringing nature into urban areas. To sustain usage, public spaces are accessible via public transport and getting around is easy in any weather, even for less mobile citizens. To encourage use of buses and trains, more covered linkways and walkways have been built to ensure a weather-proof last mile for the commuters to their destinations — housing estates, schools or workplaces. Creating people-centric spaces has meant closing some roads to cars such as in the entertainment districts Ann Siang Road, Club Street and Haji.

In downtown Singapore, the Tanjong Pagar Center, opened in 2016, has a sizeable public space called the City Room and it is integrated with an upgraded Tanjong Pagar Park. This is a prime example of how urban planning can help transform an area from just a business address into an attractive public destination.

Project Bus Stop in the Jurong Lake District demonstrates how community collaboration can help give public spaces relevance and purpose. It has free Wi-Fi; mobile phone charging points; interactive smart boards that provide content and services such as bus arrival timings, ebooks download and a journey planner; a green roof; bicycle parking; a swing and a mini art gallery.

With global warming and rising sea levels, coastal protection from floods is an urban planning concern and the Building and Construction Authority (BCA) has undertaken a study to develop innovative solutions. BCA inspects and maintains 15 kilometers of foreshore structures designed to protect coastal land. Among its innovations are the use of green materials such as large sand-filled geo-textile bags as an alternative to traditional stone revetments at East Coast Park.

URBAN GREEN SPACE

SCORE: **6.0/10**

The National Parks Board (NParks) has successfully woven nature into the urban built environment. NParks' mission has evolved over the years, from creating a Garden City to a City in a Garden. Last year alone, NParks planted more than 52,000 trees and introduced 22 new species, earning Singapore the accolade of being the world's greenest city, ahead of Sydney, Geneva, Vancouver and Frankfurt. It is estimated that one-third of Singapore's urban area is covered by greenery. Under NParks' stewardship, more than 350 parks and gardens allow all residents to enjoy the restorative benefits of nature close to home and work.

Parks and greenery soften the tone and texture of a built landscape and make a high-density urban environment more liveable. They provide recreational and social spaces, improve the wellbeing of residents, and bring relief to a busy and bustling city.

Singapore pursues innovative ways to connect its green and blue spaces through the Park Connector Network (PCN). Plans to extend this green network will continue with the Round Island Route and Rail Corridor (old railway line from city center to Malaysia in the north), stretching about 150 kilometers. Community and leisure activities are catered for along these routes.

Under URA's Landscape Replacement Area policy, new buildings must provide landscaped areas equivalent in size to the development site area. JEM in Jurong is a prime example.

Green strategies such as tree conservation and retention of existing terrain are encouraged in the development of towns to protect areas of biodiversity. Bidadari, a housing estate in the making, was formerly a public burial ground. HDB's plans for the estate feature a new regional park that will retain its hilly landscape and celebrate the area's history and heritage.

SOCIAL INFRASTRUCTURE

SCORE: **7.0/10**

Singapore has an education system recognized around the world. The Compulsory Education (CE) Act of 2003 implemented six years of free primary education for all Singaporean children from the age of seven. Students are placed in Express, Normal (Academic) or Normal (Technical) secondary courses according to how they performed in the primary leaving exam. Fees are negligible. After four or five years of education, students sit national examinations for admission to tertiary education — junior colleges, centralized institutes, polytechnics and/or institutes of technical education.

All Singaporean children aged seven to 16 enrolled in Ministry of Education funded schools receive an annual Edusave contribution to provide for school enrichment activities and encourage them to excel in both academic and non-academic areas.

Five years ago, the Early Childhood Development Agency was created and given responsibility for the development and regulation of the preschool sector, covering both kindergartens and childcare centers.

The Singapore education system stresses the need to produce students and graduates that can be employable in the future economy. The two main national universities, the National University of Singapore and Nanyang Technological University, compare favorably with others in Asia and around the world.

As Singapore's population ages, there is an increasing need to provide a comprehensive care services for seniors to age among family and friends in the community. These include hospitals, outpatient polyclinics and community-based services such as senior care centers, senior activity centers and nursing homes. For the past 10 years, the Ministry of Health (MOH) has been building acute-care and community hospitals as well as nursing homes to cater for the aging population. The number of acute hospitals has increased from 14 to 19, providing more than 10,000 beds, from 2006 to 2017.

In 2017, MOH launched the Healthcare Industry Transformation Map (ITM) for a future-ready healthcare system with the vision of championing a healthy nation for Singaporeans to live well, live long and with peace of mind.

Each HDB town is designed to be self-sustaining so residents do not need to venture out of town to meet their most common needs. Each town has education and healthcare facilities, sports complexes, recreation zones, multistory carparks and other common facilities. All HDB residential areas are connected to a public transport infrastructure, including underground, buses, and light rail transit.

Every residential complex has outdoor sports fields, illustrating the state's commitment to the good health of its citizens. Children's playgrounds are an integral part of the living environment and employ a variety of designs, advanced materials and variations in age-appropriate equipment; areas are also equipped for adults.

CLIMATE CHANGE

SCORE: **6.0/10**

As a low-lying, densely populated island in the tropics, Singapore is vulnerable to the impact of climate change. The Sustainable Singapore Blueprint released by the Inter-Ministerial Committee has set out strategies to reduce energy intensity and improve its water conservation and recycling efforts. In addition, Singapore has pledged to reduce greenhouse gas emissions.

To reduce the city's carbon footprint, the BCA has set 2030 as the target year for 80 per cent of public and private commercial buildings to be green-mark certified. Incentives will be given to industry to reduce wastage as well as improve energy efficiency, especially air-conditioning systems, which account for more than 30 per cent of electricity usage.

The Land Transport Authority (LTA) has made the last Sunday of every month car-free in the civic district and plans to reduce carbon emissions further by cutting the number of Certificate of Entitlements, allowing car ownership of 10 years, to a zero-growth rate. Shared electric cars services and more than 500 electric charging stations will be rolled out in phases. Meanwhile, shared bicycles and the use of personal mobility devices have been legalized for the last mile of journeys to encourage use of public transport.

Apart from mitigation efforts, Singapore has put in place measures to strengthen coastal protection, enhance drainage systems, increase the resilience of water supply and protect natural biodiversity. Low-lying developments are required to provide underground rainwater collection tanks to mitigate the effects of downpours, later emptying into canals. The aim is to prevent canals and rivers overflowing, flooding in low-lying areas, damage to properties and endangering human lives.

MOBILITY
7.4/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **9.0/10**

Cities that are highly livable emphasize walkability and tend to have extensive, affordable and high-quality public transport systems that connect people to jobs, schools and amenities in an efficient and reliable way. In Singapore, travel needs are largely met by trains and buses.

The rail network in Singapore is the backbone of its public transport system. The Circle Line was opened in 2011 to connect between people in the east, west and north without passing through the busy interchanges in the city center. The Downtown Line, opened in stages from 2013 to 2017, serves to improve connectivity for commuters in the north-west and east. The Thomson Line primarily serves the population in the north and will be opened in stages from next year to 2021. With the introduction of these lines, as well as the Eastern Region Line, Tuas West Extension and North-South Line Extension, the rail network will increase by about 100 kilometers to 280 kilometers by 2021.

By 2030, the rail network will further extend to include:

- Cross Island Line – providing a direct line to connect residents in the east and northeast directly to the towns in the central and western region, and augment the existing North-South and East-West Lines
- Jurong Region Line – enhancing connectivity around the Jurong region, serving the future Tengah New Town, Nanyang Technological University and Jurong Industrial Estate
- Circle Line Stage 6 – closing the loop for the Circle Line between the central east areas, and central and west areas. This will establish a more direct route to key employment areas in the Central Business District, Marina Bay and Harbor front
- North East Line extension – extending northeast to serve Punggol Downtown and northern part of Punggol, to further accommodate the growing population in the area
- Downtown Line extension – connecting the Eastern Region Line and enhancing the connectivity between the areas served by both lines

The LTA's masterplan aims to make Singapore a great city to live, work and play in. The focus is on making public transport an even more attractive mode of travel and reducing reliance on private vehicles.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.5/10**

Singapore's strategic location and extensive links to regional and global markets cement its place as the gateway and hub that connects Asia to the rest of the world. It is one of the world's top transportation hubs for sea and air cargo. Singapore's container ports are connected to 600 ports in over 120 countries, and Changi Airport is linked to 300 cities in 70 countries, with more than 6,500 weekly flights.

Singapore ranks first in Asia in the Global Logistics Performance Index and its performance in the area plays a key role in shaping a competitive business environment and supporting domestic needs. The Logistics ITM was launched in 2017 by the Singapore Economic Development Board with a 2020 vision to develop Singapore into a global leading logistics hub, helping enterprises better capture growth opportunities in the sector.

The logistics industry is divided into three categories: land, air and sea.

The maritime environment is fast-changing. For Singapore to remain competitive, a key differentiator will be the ability to create and sustain value propositions that will help grow and anchor the local maritime cluster. A high-level 2030 Advisory Committee was formed in 2016 to undertake a strategic review and chart a development strategy to take Singapore's International Maritime Centre to 2030 and beyond.

Singapore has the world's busiest port but other countries in the region are boosting their infrastructure with an eye on a bigger slice of the trans-shipment pie. To remain competitive, the city's port operations will relocate from Tanjong Pagar and Pasir Panjang to the west of Singapore, in Tuas. In 2015, the city's ports handled more than 30 million Twenty-foot Equivalent Units (TEU) of cargo; that figure is expected to rise to 65 million as the Tuas mega port gears up.

Opening in four phases from 2021 to about 2040, Tuas will be several times larger than trans-shipment harbors in Europe.

The Tuas megaport will be outfitted with new, smart and green technologies such as automated container port systems, drones, automated cranes and a new vessel traffic management system. It will include an aerospace industry transformation map developed by a multiagency team together with industry partners, unions and trade associations, was launched in the first quarter of 2018. It maps out strategies to build a future-ready aerospace industry in three key areas by pursuing operational excellence, driving innovation in emerging technologies and equippping Singaporeans with relevant skills.

According to a 2016 to 2017 Boeing forecast, world air-cargo traffic will grow by 4.2 per cent a year in the next two decades. Innovation and improved productivity are critical for Singapore to remain globally competitive.

Singapore's Air Transport ITM highlights four thrusts: innovation, productivity, jobs and skills, and enterprise. They are aimed at driving innovation and improving productivity, expanding airport infrastructure capacity and deepening skills of workers in the aviation sector, to enhance the city's aviation competitiveness. Industry agencies are considering innovative uses of unmanned Aircraft systems in Singapore's urban environment. They will explore solutions in areas such as surveillance, inspection, package and maritime delivery, and the effective and safe use of airspace.

GLOBAL CONNECTIVITY

SCORE: **9.0/10**

Changi Airport is Singapore's gateway to the world, making a big contribution to the economy, providing jobs and enhancing the country's position as a global hub for trade, finance and tourism.

The airport can handle up to 85 million passengers, but is fast reaching its capacity. Growth is expected to remain strong, supported by the demand for air travel in the Asia-Pacific. It is therefore critical for Changi Airport to expand its infrastructure and capacity.

The new Changi East will allow Singapore to cope with future growth in air traffic and make the most of the benefits that air connectivity brings to Singapore. It is a whole-of-government effort involving multiple agencies as well as Changi Airport Group and external experts. There are three main elements:

- A three-runway system, in which an existing military runway is being extended and accompanying taxiways are being constructed to cater to more flights.
- The third runway will be ready for civil aviation use in 2020, and the three-runway system will be operational in the early 2020s.
- A network of tunnels and systems, including the baggage handling system and automated people mover system, to allow for the efficient transfer of passengers, baggage and airside vehicles within Changi East and between Changi East and the existing terminals. Terminal 5, which will cater for an extra 50 million passengers in its initial phase, a 60 per cent increase in Changi's capacity. Extensive land preparation and drainage works at Changi East began in 2014.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.0/10**

Cycling is beginning to catch on, especially for short trips such as part of the daily journey to work, typically to the train station or bus interchange, or for intra-town travel. At present, cycling accounts for only one per cent of all trips in Singapore but the URA foresees growth in commuter cycling as more infrastructure and supporting facilities are built.

The National Cycling Plan, a collaborative effort involving agencies such as LTA, URA, NParks, HDB, Public Utilities Board (PUB) and SportSG, aims to develop cycling routes for recreational and short commuting purposes, which will be integrated into a comprehensive network throughout Singapore.

Under a 2013 plan, LTA is building a cycling path network of about 190 kilometers in HDB towns by 2020. The long-term aim is to provide all 26 HDB towns with a comprehensive cycling network so residents can cycle to MRT stations and neighbourhood centers.

At the same time, the authority recognizes that there are opportunities to facilitate cycling for longer distances, and one key strategy is to link up cycling paths in HDB towns to NParks' Park Connector Network.

By 2030, the 240 kilometers of cycling paths today will have grown into a comprehensive island wide cycling path network reaching well past 700 kilometers. The network will combine intra-town routes, inter-town routes, the PCN and round-island routes.

Bicycle parking facilities, on top of the thousands already provided at MRT stations, will also be encouraged in private developments. The bicycle racks will be provided in partnership with residential and commercial developers at the Singapore Sports Hub as well as at locations in Marina Bay and the Jurong Lake District.

LTA will continue to work with town councils and other agencies to provide sufficient bicycle parking within HDB estates and at key community amenities.

Other supporting cycling infrastructure, such as bicycle crossings and direction signage, will be built to improve safety and convenience for cyclists. A code of conduct for cyclists and a national cyclist education program are also being developed. The LTA also has introduced bicycle-sharing pilot schemes.

BUILT FORM: PARKING PROVISIONS

SCORE: **3.0/10**

Motorists of the future will have more reason to leave their cars at home, with a proposed change to parking provisions in private buildings that will also free up land for other uses. The proposed bill amendments not only give LTA more flexibility in calibrating parking provisions in private developments, it will pave the way for fewer carpark spaces in upcoming housing precincts like Kampong Bugis, Holland Plain, Bayshore and Jurong Lake District.

Presently, LTA stipulates the minimum number of parking spaces for various uses. For example, residential projects must provide one car space per residential unit. For office developments, provision of one car space per 450 square meters of gross floor area in zones spanning the central business district and Marina Bay; parking provision ratios are different in each zone.

But the trend towards fewer carpark spaces in new buildings has been gaining traction even under existing rules.

Some 704 carpark spaces were lost in 2011 when Market Street Car Park, Singapore's oldest multistory carpark, was demolished to make way for a 40-story Grade A office tower (CapitaGreen). The new office tower houses only 180 carpark lots. Golden Shoe Car Park once housed 1,000 carpark spaces — the upcoming integrated development on the site will house 350 car lots and 17 motorcycle lots.

Therefore, under the proposed amendments to the Parking Places Act, LTA will be able to specify the number of parking lots in private developments in terms of a range with a lower and upper bound. The new provisions will allow developers to test new concepts of space and land planning and new parking concepts such as hub carparks — one that is shared by a few buildings.

FUTURE MOBILITY: SERVICES

SCORE: **8.0/10**

In space-starved Singapore, 12 per cent of land is set aside for roads and transport infrastructure. With a growing population and more than a million vehicles on the road, the challenge lies in optimizing the use of that limited space.

Beeline is a demand-driven, shared transit experiment by GovTech and LTA through an open, cloud-based smart mobility platform developed to provide data-driven shuttle bus services for commuters. The platform enables commuters to book a seat through a smartphone app on buses provided by private operators. In March 2017, Grab, a private technology company offering ride-hailing transport services, launched a shuttle service in collaboration with GovSec. This new service, called Grab Shuttle, is powered by Beeline.

Through separate partnership agreements with the LTA, Delphi Automotive Systems and nuTonomy are trialing their shared autonomous mobility-on-demand concepts. If these trials prove successful, the projects will be developed into full-scale mobility solutions for towns in Singapore, bringing more comfort and convenience for commuters, especially for first-and-last-mile and intra-town travel.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **9.0/10**

LTA has signed agreements with companies to develop solutions for autonomous truck platooning to transport containers from one port terminal to another, as well as issued a request for information for the development of self-driving utility vehicles for waste collection and road sweeping.

Trials for autonomous mobility-on-demand services were launched, which are envisaged to comprise of a fleet of shared self-driving shuttles or pods that commuters will be able to book through their smartphones to bring them in air-conditioned comfort from their doorstep to the train station or other neighbourhood amenities. This provides for a more comfortable option for first-and-last-mile connectivity and brings greater mobility to the elderly and other commuters who may have difficulty in taking present-day public transport.

In addition, a three-and-a-half-year project is underway to develop and trial autonomous buses with the possibility to be deployed to serve fixed and scheduled services for intra- and inter-town travel.

A nationwide charging standard for electric vehicles (EVs) was adopted on 30 June 2016 for all new public EV charging infrastructure. LTA and EDB, which co-chairs the Electro-Mobility Singapore taskforce, announced that Type 2 AC and Combo-2 DC charging systems would be adopted.

BlueSG Pte Ltd will operate the program for 10 years and install an island-wide EV charging infrastructure of 2,000 charging points, of which up to 20 per cent will be available for public use. The EV car-sharing program will be rolled out progressively across Singapore.

Given Singapore's busy airspace and densely populated urban environment, the flying of an unmanned aerial vehicle (drone) must be carried out in a responsible manner because of the risk to aviation and public safety.

TECHNOLOGY
7.8/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

It is envisioned that a Smart Nation will be a leading economy powered by digital innovation. To drive pervasive adoption of digital and smart technologies, several key strategic national projects have been identified as key enablers in Singapore's Smart Nation drive:

- National Digital Identity – for citizens and businesses to transact digitally in a convenient and secure manner
- Epayments – allowing everyone to make simple, swift, seamless and safe payments
- Smart Nation sensor platform – deployment of sensors and other Internet of Things (IoT) devices to make Singapore more livable and secure
- Smart Urban Mobility – using data and digital technologies, including artificial intelligence and autonomous vehicles, to enhance public transport
- Moments of Life – bundling government services to the citizen at different moments of his/her life.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Ultra-high-speed broadband is a critical national enabler to spur the development of knowledge-based sectors, such as research and development, interactive digital media and creative industries. It will be a catalyst for development and deployment of innovative interactive digital services to homes, schools and businesses.

The Next Generation Nationwide Broadband Network (Next Gen NBN) will reinforce the status of Singapore as an info-comm hub and open doors to economic opportunities, business growth and social vibrancy. It is envisioned that this will eventually provide a nationwide ultra-high-speed broadband access of one Gbps and more, to all physical addresses including homes, schools, government buildings, businesses, hospitals and non-building access points.

In the past few years, fiber take-up by non-residential users has risen steadily, and passed 85 per cent in April last year.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

The Next Gen NBN will provide ultra-high-speed broadband access of 1 Gbps and more, delivering a slew of next generation services at all physical addresses including homes, schools, government buildings, businesses and hospitals.

OPEN DATA

SCORE: **7.0/10**

Data.gov.sg was launched in 2011 as the government's one-stop portal to its publicly available datasets from 70 public agencies. More than 100 apps have been created using the government's open data.

The new data.gov.sg, now in public beta, goes beyond being a data repository. It aims to make government data relevant and understandable to the public, through the active use of charts and articles.

This website is an initiative of the Ministry of Finance that is managed by the Government Technology Agency of Singapore.

The government's principles for open data are that it should be easily accessible, available for cocreation, released in a timely manner, able to be shared in a machine-readable format and be as raw as possible.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

The Personal Data Protection Act (PDPA) of 2012 covers the collection, use, disclosure and care of personal data. It recognizes both the rights of individuals to protect their personal data, including rights of access and correction, and the needs of organizations to collect, use or disclose personal data for legitimate and reasonable purposes.

Today, vast amounts of personal data are collected, used and even transferred to third parties. This trend is expected to grow exponentially as the processing and analysis of large amounts of personal data becomes possible with increasingly sophisticated technology.

By regulating the flow of personal data among organizations, the PDPA also aims to strengthen and entrench Singapore's competitiveness and position as a trusted, world-class hub for businesses.

The Act also provided for the establishment of a national Do Not Call Registry, allowing residents to opt-out of receiving marketing phone calls, mobile text messages such as SMS or MMS, and faxes from organizations.

PLANNING AND POLICY

SCORE: **9.0/10**

The Info-communications Media Development Authority provides the foundation for various information and communication technologies services and media content to be created and to flourish in a well-established system. Today, Singapore is one of the most connected countries in the world in terms of broadband speeds, and local audiences to make informed choices about a wide range of media content.

The Next Gen National Info-comm Infrastructure, which includes a nationwide fiber broadband network connecting homes, offices, schools and other buildings, has been providing ultra-high-speed internet access in a highly competitive telecom market.

Another Info-communications Media Development Authority (IMDA) initiative, the Wireless@SG free hotspot service, offers access to users on-the-go in thousands of locations island-wide. For businesses, it provides a way to go online for their business needs as well as to offer a form of access to customers.

On the broadcast front, Singapore's free-to-air channels have been broadcasting in digital since December 2013, using the DVB-T2 (Digital Video Broadcasting – Second Generation Terrestrial) broadcasting standard. To keep pace with emerging media trends, the IMDA has also developed a more comprehensive way of tracking media consumption patterns in the form of the Singapore Television Audience Measurement (SG-TAM).

URBAN SYSTEMS
5.6/10

POWER GENERATION AND DISTRIBUTION

SCORE: **5.0/10**

As a small, resource-constrained country, Singapore imports almost all its energy needs, and has limited renewable energy options. Singapore's high average annual solar irradiation of about 1,500 kWh/m2 makes solar photovoltaic a potential renewable energy but the island state has limited available land for the large-scale deployment of solar panels. Other obstacles are high cloud cover and urban shading.

With the limited renewable energy options available to Singapore and the current technological capabilities, the country is not able to generate sufficient baseload electricity from renewable sources reliably. Nevertheless, Singapore aims to increase solar deployment from the current 47 MWp to about 350 MWp of electricity by 2020. By 2030, it is estimated that renewable energy could contribute up to eight per cent of peak electricity demand.

Since April this year, households and businesses in Jurong could buy electricity from a retailer with a price plan that best meets their needs. This soft launch of the Open Electricity Market is in the process of being extended to the rest of the country and will involve 1.3 million accounts, mainly households.

The Energy Market Authority (EMA) also has regulatory measures to further strengthen the reliability of Singapore's electricity supply, 80 per cent of which is generated from gas that comes through pipelines from Malaysia and Indonesia. With these measures in place, Singapore's electricity grid maintains its status as one of the most reliable in the world, with an average interruption time of less than one minute per customer per year.

As a small country without any natural or energy resources, Singapore's energy challenge is a multifaceted one. Singapore needs to ensure a secure energy supply for a competitive economy, while developing a sustainable living environment.

Through several initiatives, EMA is a catalyst for Research and Development (R&D) to keep energy options open, enhance energy efficiency and strengthen the resilience of the power grid. Besides addressing industry-relevant challenges, these initiatives also promote knowledge exchange and capabilities development among end-users, technology providers and institutes of higher learning.

In the past few years, EMA has given almost CAD60 million to 25 companies and 11 institutes of higher learning or research under the RIE2015 Energy Innovation Research Program.

Under RIE2020, EMA will build on the past momentum and focus R&D efforts on the areas of power utilities, energy storage and smart grids. A sum of CAD44 million has been allocated to launch competitive grant calls and test-beds projects on this front.

WATER TREATMENT AND DISTRIBUTION

SCORE: **8.0/10**

Water demand in Singapore is about 1.628 billion liters a day, with homes consuming 45 per cent and the non-domestic sector taking the rest. By 2060, Singapore's total water demand could almost double, with the non-domestic sector accounting for about 70 per cent. By then, reclaimed water (NEWater) and desalination will meet up to 85 per cent of Singapore's demand.

The sewerage network collects used water from domestic and non-domestic (e.g., industrial, commercial) sources. Used water is channeled through a combination of gravity sewers and pumping stations to the water reclamation plants, where it is treated in accordance with international standards.

Part of this treated used water, which is safe enough to be returned to nature, is sent to a separate treatment system in the NEWater plants. The remainder is discharged to the sea.

Driven by increasing water demand, rising operational costs, manpower constraints and new challenges such as climate change, the PUB is leveraging digital solutions and smart technologies to strengthen its operational resilience, productivity, safety and security. The integration of smart water technology will be a key pillar of Singapore's water resource management to achieve greater efficiencies, and faster response time in planning, operations and service delivery. PUB is exploring two key innovations for remote water quality monitoring, the Remote Micro-Invertebrate Detector and the Autonomous Boat.

The Remote Micro-Invertebrate Detector is a portable low-cost device easily deployed onsite to provide real-time detection and identification of images using artificial intelligence. The unit is linked to a mobile app and chat-bot, which allows the system to perform 24/7 real-time testing of water samples onsite, respond to commands, send live image reports, and trigger alerts when anomalies are detected. PUB plans to use them on a larger scale by the end of 2020.

Because of desalination's contribution, it is important for PUB to monitor the quality of seawater intake to the plants. PUB is test-bedding the Autonomous Boat, which has the capability to brave choppy waters to perform real-time water quality monitoring via onboard sensors, collect water samples, and take photos and videos of water conditions. Programmed to avoid obstacles in the water, the boat is also able to self-navigate to the designated sampling points.

WASTE MANAGEMENT

SCORE: **3.8/10**

Growth in Singapore's population and economy has contributed almost a seven-fold increase in the amount of solid waste disposed of, from 1,260 tons a day in 1970 to 8,443 tons a day in 2017.

With waste quantities projected to continue increasing with growing affluence and population, Singapore's main challenge is finding sufficient land for waste disposal. It has therefore adopted a series of strategies for a more sustainable solid waste management system.

Singapore's integrated solid waste management system focuses on minimization and recycling, or simply the three Rs (3Rs) — reduce, reuse, recycle. Waste to Energy (WTE) incineration plants offer the best technical solution by reducing waste volume efficiently to conserve landfill space. The 3Rs play a crucial role by preventing waste generation at its source and bringing with them many benefits.

Under the National Recycling Program launched in April 2001, public waste collectors licensed by the National Environment Agency are required to provide recycling bins and recycling collection services to all HDB estates, private landed properties and condominiums/private apartments opted into the public waste collection scheme. The mixed recyclables are collected by dedicated recycling trucks and sent to materials recovery facilities for sorting and transportation to recycling facilities for further processing.

Today, there are four WTE plants located at Tuas and Senoko; and an offshore landfill, Semakau Landfill, which receives non-incinerable waste and incineration ash via the Tuas Marine Transfer Station. Waste collectors sending waste to the four WTE plants and Tuas Marine Transfer Station must have a waybill to indicate the type and source of waste.

The voluntary Singapore Packaging Agreement (SPA) is a joint initiative by government, industry and non-government organizations to reduce packaging waste, which constitutes about one-third by weight of Singapore's domestic waste.

Between 1 July 2012 to 2017, the SPA signatories have cumulatively reduced close to 39,000 tons of packaging waste and saved about CAD90 million. This SPA, originally due to expire on 30 June 2015, has been extended for five years.



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07

San Francisco is a place of fog-shrouded icons like the Golden Gate Bridge, cable cars and the supposedly escape-proof Alcatraz.

AT A GLANCE

RANKED **07**
CITY SCORE: **27.84**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.2/10	**7.4/10**	**7.0/10**	**6.2/10**

At less than 130 km², San Francisco is a small city with a lot going on. It has intriguing neighbourhoods, views of the Pacific Ocean and San Francisco Bay at every turn, and world-class performing arts, dining and cultural attractions.

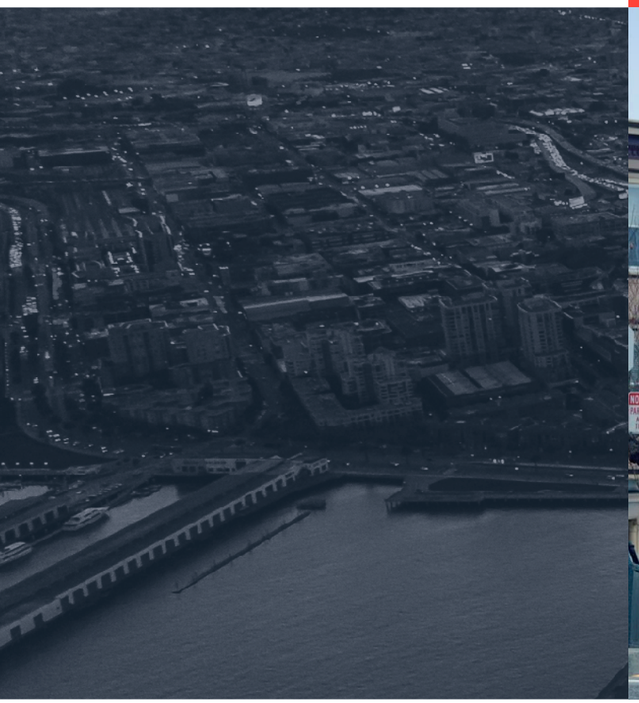
San Francisco has been a magnet for smart, creative and mostly young people who want to be part of its burgeoning *tech* industry. Through the technologies and products created there, San Francisco is changing the world. The growth is spilling into other sectors of its economy.

This rapid growth has been accompanied by social and infrastructure problems too. The booming economy has increased the demand for accommodation and because house building is occurring at a slow rate the prices have skyrocketed. San Francisco is one of the most prosperous cities in the world but equally has a large homeless population.

Not only earthquake prone, San Francisco is especially vulnerable to the effects of climate change. A large swath of the city will become susceptible to flooding as climate change pushes sea levels higher while subsidence causes land levels, especially in expansive landfill areas, to drop.

The city is facing these challenges head on. Today, San Francisco is planning for many big and bold infrastructure projects that range from creating new rail connections and seawalls to eliminating existing highways and reinstating tidal marsh lands as a buffer against the extremes of sea-level rise.

Through the California gold rush, 1906 earthquake and ensuing fire, and dot-com boom and bust, San Francisco has been a city of constant reinvention. Its ability to attract leading companies, top talent and extensive investment is a sign that the city will continue to be hugely influential in the future.

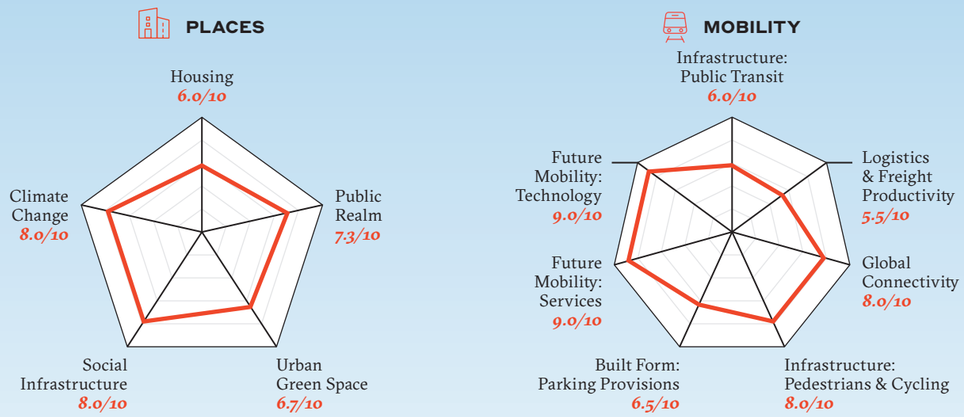


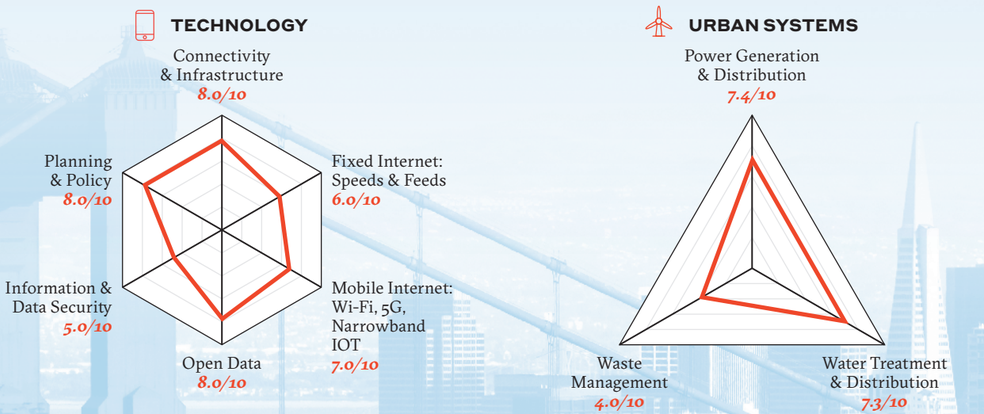




SAN FRANCISCO

CITY ASSESSMENT





PLACES
7.2/10

HOUSING

SCORE: **6.0/10**

The San Francisco General Plan has a Housing Element that analyzes demographic and housing data for the city, and outlines goals and the policies to achieve them. The goals are to:

- Prioritize permanently affordable housing
- Recognize and preserve neighbourhood character
- Integrate planning for housing, jobs, transportation and infrastructure
- Cultivate a city as a sustainable model of development.

To meet these goals the city has produced area plans that are being implemented in prioritized areas. Thirteen areas have already adopted these plans; five more have yet to do so.

Many components of the plan are already addressed by existing policies. Some priorities such as integrating public health and housing planning are waiting for techniques to be implemented. Other priorities such as community participation in plans and consideration of *in-law* units are recognized in the plan, but policies have not been formulated to address them. In the Housing Element, a wide range of problems are recognized, but funding remains an issue.

PUBLIC REALM

SCORE: **7.3/10**

The streetscape is addressed directly in the Urban Design Element and Recreation and Open Space Element of the General Plan. The Urban Design element recognizes the city's Better Street Plan's ability to improve the many functions of streets and has incorporated it into the General Plan. The demands of street hierarchy, landscaping, lighting and recreation are recognized. Although some policies are recommended, funding and execution are yet to come.

In the Recreation and Open Space Element, the report details programs that have been carried out, including Living Streets pilots, the Street Park Program and Better Streets Plan. There are also numerous priorities the city wants to focus on.

Apart from the streetscape, the Recreation and Open Space Element addresses open space in an array of best practices, some of which have programs in place, and others which are funded. Notable priorities include: supporting urban agriculture, preserving sunlight in open spaces, providing pertinent and appropriate programming in differing communities, supporting civic serving spaces and expanding privately owned public space requirements.

These priorities have varying levels of programs and structures in place to maintain them. Policy 2.6 is particularly concerned with public squares and gathering places, recognizing that in San Francisco protests and assemblies are commonplace, and the city's maintenance of these spaces for regular and special uses is important. The plan outlines the campaigns in place to support this work.

San Francisco manages waterfront and riparian zones on each side of the city. It focuses on the Blue Greenway, addresses piers and wharves, and encourages interconnection of coastal green space. The plan sees biodiversity and ecological health as a priority because the city is losing habitat and the species that live there. Restoration projects are already under way in many cases. Public use of sites in private ownership may be possible in certain cases.

URBAN GREEN SPACE

SCORE: **6.7/10**

The General Plan points out the need to further connect parks and open spaces, especially along marine corridors and in neighbourhoods with fewer resources. Within the Urban Design Element street landscaping is also addressed, indicating the relative importance of streets, and is encouraged in public and private areas.

SOCIAL INFRASTRUCTURE

SCORE: **8.0/10**

The city's Planning Department outlines the need to support the Unified School District (USD) and Community College District, although it doesn't have its own education planning beyond the goals of encouraging recreation, education and civic activities in neighbourhoods and communities. With the USD, there are clearly defined and up-to-date goals for achievement, access and equity, and accountability. The report has an accessible executive summary that outlines how much is allocated to each goal.

The Planning Department prioritizes a section on public health centers for educational and preventative services.

The plan outlines the principles of geographic diversity, access and convenience, and the pairing with schools and community centers. It defers to the Public Health Department for details, which has a thorough list of plans including Hospital Institutional Master plan, Zuckerberg General Hospital Annual Report, Community Health Improvement Plan, Health Care Access Plan, Prevention Strategic Plan and Department of Public Health Annual Report.

The General Plan sees childcare as an objective of neighbourhood public services that needs to be linked with other services, and is attuned to the financial barriers it presents to parents. Within the Family Friendly City Initiative is a section on childcare facilities detailing recent modifications to the planning code in the area.

The General Plan's Arts Element recognizes the importance of these cultural assets. There is a public art trust funded by a one per cent fee that supports the Art Commission's creation, installations and conservation of art in public spaces, for which there are clearly defined goals and a strategic plan.

CLIMATE CHANGE

SCORE: **8.0/10**

The city has an in-depth climate action strategy that includes direct risk and transitional risk. These risks are addressed in planning frameworks with strategies for sustainability and resilience. The direct risks assessed are sea level rise, flooding, heat waves, water and energy supplies, transportation and property damage and ecosystem risks.

The Climate Action Report recounts how San Francisco has reduced its total carbon footprint because of more efficient buildings, less waste and cleaner transportation. The report details the further reductions needed to get to the 80 per cent reduction municipal target by 2050.

Produced with support from 100 Resilient Cities, the Resilient San Francisco Stronger Today, Stronger Tomorrow report defines the following goals:

- Plan and prep for tomorrow
- Retrofit, mitigate and adapt
- Ensure housing for San Francisco residents today and after a disaster
- Empower neighbourhoods through improved connections
- These goals have clearly defined actions and indicators.

MOBILITY
7.4/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.0/10**

The Metropolitan Transportation Commission recently released its draft 2019 Transportation Improvement Program and draft amendments to Plan Bay Area 2040, an integrated long-range transportation, land use and housing plan.

In downtown San Francisco, every public transit option, including bus, subway, cable car, bike share, and commuter rail, is available. The California High-Speed Rail Program, which will provide fast connections to the north and south of the state through San Francisco, is being funded and built.

A new multimodal station is under construction and will serve as a transit hub connecting all services in the Bay Area. The Clipper card is a contactless payment system for all 26 Bay Area agencies and efforts are being made to integrate the card as a payment option for new mobility platforms as well.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **5.5/10**

While the major freight hub in the Bay Area is in Oakland rather than San Francisco, the Port of San Francisco does unload automobiles and dry bulk cargo. The San Francisco Bay Area Goods Movement Plan, which is part of Plan Bay Area 2040, identifies a handful of opportunity packages that articulate different strategies to address needs and deficiencies of the goods movement system. In the city, there are limited opportunities to build new capacity, so infrastructure investments are focused on shifting trucks to rail. *Opportunity packages* from the plan include technology elements such as Intelligent Transportation Systems to maximize efficiency of existing roads.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

The San Francisco International Airport (SFO) Masterplan, adopted in 1992, provided a long-term plan for expansion and development.

Implementation of projects under the master plan has continued, but sustained increase in passenger traffic necessitated a new plan to accommodate future growth. The Airport Development Plan 2016 includes a series of projects that would meet future projected demand and potential long-term growth of up to 71.1 million annual passengers. SFO is undergoing billions of dollars in renovations to meet these plans.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **8.0/10**

The San Francisco Municipal Transportation Agency (SFMTA) 2013-2018 Bicycle Strategy sets new directions and policy targets to make cycling a part of everyday life. San Francisco is a Transit First city, which prioritizes bikes, pedestrians, and transit over cars. A Complete Streets group has produced the Better Streets Plan containing unified standards, guidelines and implementation strategies to govern how the city designs, builds and maintains its pedestrian environments. Alas, much of the city was built before pedestrian environments were front of mind.

San Francisco Municipal Railway (Muni) provides bike racks to cater for more than 10,000 bikes in 3,000 locations and 67 on-street corrals. Bay Area Rapid Transit (BART) also has bike lockers for commuters but despite the investment in bike-locking infrastructure, Muni receives 300 requests a year for more racks. Dock-less bikes will likely increase that number, as they are required to lock to bike infrastructure.

Vision Zero policy aiming for zero pedestrian deaths includes low speed zones and enforcement measures to keep down traffic speed and gridlock.

BUILT FORM: PARKING PROVISIONS

SCORE: **6.5/10**

SFMTA's project, SFpark, is at the forefront of parking policy and is one of the more aggressive parking programs in the nation. SFpark aims to reduce circling for spaces by creating more availability through deployment of variable parking rates by demand.

As part of the Planning Department's Citywide Policy Planning, the Better Neighbourhoods Program is working in several areas to encourage more housing. Where the proximity of transit and services makes it possible to live with fewer cars, the program is proposing revisions to density, parking and other controls.

The city has developed a draft menu of options to provide developers with flexibility in selecting a combination of Transportation Demand Management measures that will work best for reducing driving trips associated with their project and neighbourhood, thus reducing the need for parking. Developers will be required to use a tool to pre-select these measures before filing a development application with San Francisco Planning.

The city has a large parklet program and has turned parking spaces into places for scooter parking. Most parking lots are now built on.

FUTURE MOBILITY: SERVICES

SCORE: **9.0/10**

San Francisco has many point-to-point services, including electric scooters, mopeds, and bikes. There is a permit process in place and pilot programs that allow the city to examine data collected by the service providers. In one such pilot, Scoot, an electric moped service, is granted on-street parking permits in exchange for data. App-based, on-demand services as well as ride-share and car share services are rampant in the city. In fact, ride-share usership is so high that it threatens public transport patronage. The widespread use of ride-share services combined with the car sharing services also reduces the need for car ownership.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **9.0/10**

Policies and strategies surrounding connected and autonomous vehicles are set by the state and largely out of the city's hands. A trial of an autonomous shuttle is underway at Treasure Island, an artificial island in the San Francisco Bay.

The City Fleet Zero Emission Vehicle Ordinance mandates the electrification of the city's light duty passenger sedan fleet by 2022, and the EV Readiness Ordinance mandates all parking spaces in new construction must be made ready to support electric vehicle charging.

The citywide Electric Mobility Strategy, which is focused on electrification of private vehicles in the transport sector, will lay out a vision for reducing adverse impacts of private transport and identify pilots, programs, policies and partnerships to help create a zero-emission transport sector. This strategy is nearing completion by a subcommittee of the Electric Vehicle Working Group.



TECHNOLOGY
7.0/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

San Francisco's Department of Technology has published many versions of its Connectivity Plan, most recently about a year ago. The plan covers topics such as the expansion of fiber to city facilities, fiber infrastructure deployment guidelines via the Dig Once Legislation, deployment of free Wi-Fi (#SFWi-Fi; with SFO and a 4.8 km section of Market Street being the largest deployments), and deployment of broadband internet service to residential and business locations, with an emphasis on seniors and low-income residents. The plan shows an intent to have greater government control of fiber infrastructure deployments.

At the end of January, the city and County of San Francisco issued a Request for Qualifications (RFQ) to private firms, "To design, build, finance, operate and maintain a citywide Fiber to the Premises Network, Lit Fiber and Wi-Fi Services project".

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

A growing number of residential and commercial internet service providers serve San Francisco. AT&T is the Local Exchange Carrier for the city residents. It has many competitors, the biggest being Comcast/Xfinity and Sonic with wide coverage. AT&T has been deploying fiber to homes in many new residential projects via fiber microduct. AT&T is now offering a 1000 Mbps fiber service and Sonic has matched it in some neighbourhoods. Comcast/Xfinity has recently begun rolling out DOCSIS 3.1 (coaxial not fiber-based) 1000 Mbps per second service as well.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

The City of San Francisco's Department of Technology has outlined its plan for free public Wi-Fi, at present only available on a stretch of Market St, at the international airport, and in some parks.

The city is hoping to cover areas such as significant parks (within the city), city buildings, and important areas such as major thoroughfares and visitor areas. Proliferation of Wi-Fi in the city will be a combination of public and private means, ushering in the age of the Internet of Things (IoT).

Within San Francisco, and more broadly the US, innovation in and deployment of cellular networks is primarily done by private providers. While 3GPP has issued Release 15, which contains the initial 5G standards, 5G is still being finalized and realistically won't be in the market until 2019. Some service providers have announced Narrowband IoT and/or Cat M deployments for this year, but the results are still to be seen. Meanwhile, 4G LTE mobile internet offerings are readily available via private cellular providers.

OPEN DATA

SCORE: **8.0/10**

The City of San Francisco, the State of California and the US all have free websites containing published government data. That data is accessible to any citizen though dependent on a person's ability to get online. Accessible versus readily accessible requires a home internet connection or mobile services, and the city's plan to increase fiber proliferation throughout San Francisco will only increase the availability of Open Data to each citizen.

INFORMATION AND DATA SECURITY

SCORE: **5.0/10**

There is no comprehensive data security or privacy legislation in the US although some sectors of online activity and markets are dealt with in separate legislation (FTC Act, Financial Services Modernization Act, HIPAA, etc.). Given recent data breaches of private user data, and greater public awareness of how their own data is marketed, sold and used, improvement in this area is certainly possible in the future.

PLANNING AND POLICY

SCORE: **8.0/10**

The City of San Francisco's Department of Technology has published a Connectivity Plan, and issued a request for a quotation for fiber network expansion and connectivity goals.

URBAN SYSTEMS
6.2/10

POWER GENERATION AND DISTRIBUTION

SCORE: **7.4/10**

The 2012 Mayor's Task Force Recommendations Report presented three main areas of coordinated action to meet 100 per cent of electricity demand with renewable power by 2023:

1. Improving energy efficiency to reduce total demand
2. Increasing in-city renewable distributed generation to reduce the need for imported green power
3. Providing all SF customers with 100 per cent renewable power purchasing option.

To achieve these goals the city will need public policy, funding and financing mechanisms, and public education and outreach.

In 2010, the California Public Utilities Commission (CPUC) authorized Pacific Gas & Electric's deployment of smart meters through an Advanced Metering Infrastructure project. In 2012, an opt-out option was included for those residential customers who did not want to have a wireless smart meter.

In 2010, CPUC required all its independent operating units to develop smart grid deployment plans and file an annual report each year on its activities as well as estimates for the costs and benefits to ratepayers.

The city has received several state and federal grants to study and implement renewable energy projects, policies and financing mechanisms, principally the US Department of Energy's Solar America Cities and SunShot Initiative and the California Energy Commission (CEC) Public Interest Energy Research grants. Through the Solar America Cities grant funding, SF Environment could develop outreach tools such as the SF Solar Map, streamline permitting processes and develop innovative financing and purchasing models to help reduce costs and increase renewable energy deployment. The 2011 Updated Electricity Resource Plan outlined the Green Test Bed concept to support clean-tech demonstration projects in San Francisco. The city has worked with industry to deploy such new technologies, including urban wind turbines and electric vehicle charging stations.

California is a leader in clean energy technology. San Francisco, with its unique position at the center of clean technology, seeks to support emerging energy generation technologies.

Research, Demonstration and Deployment (RD&D) programs are an essential part of the effort to achieve California's climate and energy policy goals. As California moves towards a clean energy future, the technologies and practices that keep the state's electricity and natural gas systems safe, reliable and affordable must be modernized.

Each of the RD&D programs drive investment in new and emerging energy technologies and solutions that provide benefits to Californians. By testing ideas and sharing results publicly, these programs help investors, innovators and policymakers plan efficiently for California's clean energy future.

CPUC and other agencies support innovation and testing of new technologies.

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.3/10**

The 2015 Urban Water Management Plan presents supply and demand projections to 2040. The Water System Improvement Program (WSIP) is a CAD6.3 billion capital program to upgrade the Hetch Hetchy Regional Water System. The Phased WSIP Variant option was adopted in 2008, establishing a mid-term planning milestone this year when water demands through to 2030 will be re-evaluated with current information and analysis.

The Bay Area Integrated Regional Water Management Plan of 2013 included an assessment of the potential climate change vulnerabilities of the region's water resources and set out climate change adaptation strategies.

Some projects and initiatives have been funded and others are in the planning stage.

The City of San Francisco passed an ordinance in 2015 requiring gray-water recycling in all new commercial building developments larger than 23,226 square meters.

Tesla Treatment Facility is an ultraviolet drinking water disinfection facility that enhances the Hetch Hetchy System's high-water quality.

Bay Area Regional Reliability is a planning effort between seven water agencies in the area to identify projects and processes to enhance water supply reliability across the region, facilitate water transfers during critical shortages, and improve climate change resiliency. Its most recent Drought Contingency Plan was published early this year and focuses on drought mitigation and response.

The plan describes 15 viable possibilities for drought mitigation including interconnections, expanded storage, treatment/supply and operations measures.

The Silicon Valley Advanced Water Purification Center opened in 2014 and has been successfully purifying treated wastewater ever since. Agencies have been working with the center to develop additional supplies for groundwater replenishment by 2022, which will help augment overall drinking water supplies.

The newly constructed Salesforce Tower, the tallest building in San Francisco, will soon house the largest water recycling system in a commercial high-rise building in the US. A black-water system will recycle all the water used in the building to be available again for non-potable uses, saving about 114,000 liters of fresh water a day.

The San Francisco Public Utilities Commission (SFPUC) operates all wastewater treatment plants in San Francisco and handles all biogas generated as a byproduct of plant-treated sewage. Part of the energy that powers the SFPUC's Oceanside and Southeast Wastewater Treatment Plant is generated from biogas. This renewable biogas-fueled cogeneration technology provides both heat and electricity for wastewater treatment plant operations. San Francisco can generate up to 3.2 megawatts of renewable energy by capturing and then combusting the methane gas released during the decomposition and digestion of sewerage sludge. Options for biogas use, along with technologies for biogas processing and handling, are discussed in the SFPUC's Long-Term Biosolids Management Plan.

The SFPUC recently launched the Sewer System Improvement Program (SSIP), a 20-year citywide investment to upgrade the aging sewer system and provide a more reliable, sustainable and seismically safe system. The SSIP includes a series of facility upgrades at the Southeast Treatment Plant in the Bayview neighbourhood of San Francisco, which treats 80 per cent of the city's wastewater. The program has been developed to address the long-standing problems of odors and seismic vulnerability, as well as other operational challenges related to the aging solids handling facilities at the southeast plant. In March 2018, the SFPUC Commission approved the Biosolids Digester Facilities Project, which will replace and relocate the outdated existing solids treatment facilities with more reliable, efficient and modern technologies.

The SFPUC undertook the Water System Improvement Program (WSIP) to ensure the ability of the Regional Water System (Hetch Hetchy) to meet goals for water quality, seismic reliability, delivery reliability and water supply. WSIP is funded at CAD6.2 billion.

WASTE MANAGEMENT

SCORE: **4.0/10**

San Francisco's Mandatory Recycling and Composting Ordinance requires city residents and businesses to properly separate recyclables and compostables and keep them out of landfill.

San Francisco diverts 80 per cent of all waste generated in the city away from landfill disposal, the highest rate of any big American city. This outcome is achieved through a combination of source reduction, reuse and recycling and composting programs. The city is not one of the greenest cities in North America by chance; it employs innovative policies and financial incentives, as well as outreach and education.

San Francisco has mandatory composting and recycling laws and zero waste policies. Residents are required to separate their rubbish into commingled recyclables, compostable materials and remaining trash in three separate bins for curbside collection. Nevertheless, the city still sends 36 per cent of compostable materials to landfill.

San Francisco has a goal of zero waste, which may be achieved by as early as 2020. It has banned single-use plastic checkout bags, and has passed ordinances for construction and demolition debris recovery and cigarette litter abatement. Instead of contracts with waste disposal contractors, the city has a unique long-term ordinance under which they set and approve the rates. While landfill disposal is at its lowest level on record, San Francisco still sends more than 400,000 tons of material to landfill each year. San Francisco is served by Recology, which transports waste to Hay Road Landfill in Solano County.

The plastic checkout bag ban applies to all retail stores and food establishments. It requires a charge on allowed checkout bags — compostable bags, recycled paper bags, or reusable bags. Shoppers can avoid the charge by bringing their own bag.

The Food Service Waste Reduction Ordinance requires food vendors and restaurants in San Francisco to use compostable or recyclable to-go containers.

Beginning 1 October 2014, no person can sell or distribute bottled water at an event held indoors or outdoors on city property, including a city street where the event sponsor has access to on-site potable water connections adequate to meet the hydration needs of the event participants or attendees.

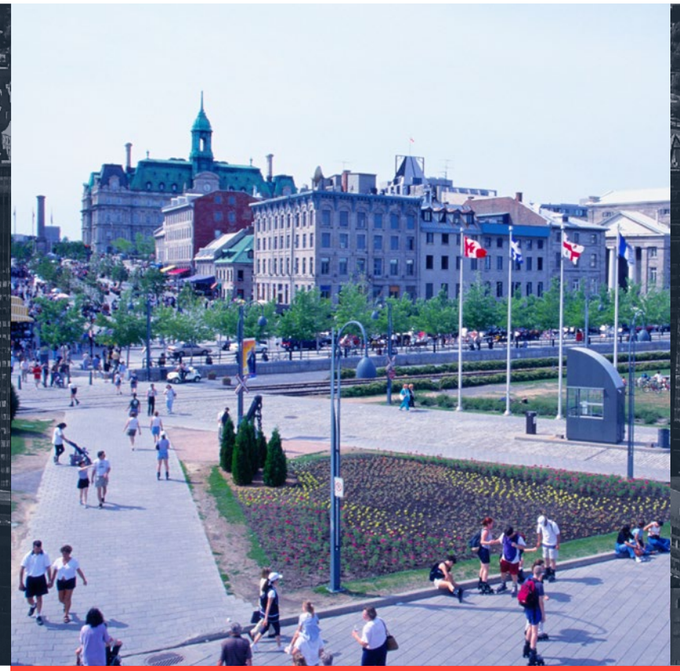
The Landfill Disposal Agreement between the city and the waste disposal contractor includes clauses on beneficial-use material. In addition, a major interagency, regional planning effort led to the development of the Long-Term Management Strategy to incorporate beneficial uses of dredged material into local projects.

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08





MONTRÉAL

As the city where WSP has its headquarters, Montréal holds a special place in our hearts. Located in Québec, Canada's largest province, the city is a safe, cosmopolitan and green metropolis with a rich, multicultural fabric and a thriving economy.

AT A GLANCE

RANKED **08**
CITY SCORE: **27.73**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.0/10	**6.9/10**	**7.7/10**	**6.2/10**

It is an important center of commerce, education, aerospace, transport, finance, education, arts, culture, tourism, food and fashion and, increasingly, the high-tech, life sciences and creative sectors.

Despite its relatively small population compared with global giants, Montréal is the most urbanized and densely populated area of Québec. It is known for its quality of life, openness, cosmopolitan vitality and architectural character — a contrast between old and new. Eighty-two municipalities make up Montréal and housing costs are quite competitive. Low interest rates, high disposable incomes and municipal incentives have made home ownership more affordable.

Economically, the city is prospering, as is evident from all the cranes on the skyline and other developments in full swing. GDP and employment are on the rise. The government is investing considerably in infrastructure, education and healthcare to improve quality of life. Montréal is also replacing aging infrastructure, maintaining and rehabilitating the road network while developing the Bus Rapid Transit and extending the metro's blue line.

All of this is helping the economic growth of the city, fostering labor development, enabling resident mobility and creating favorable conditions for innovation.

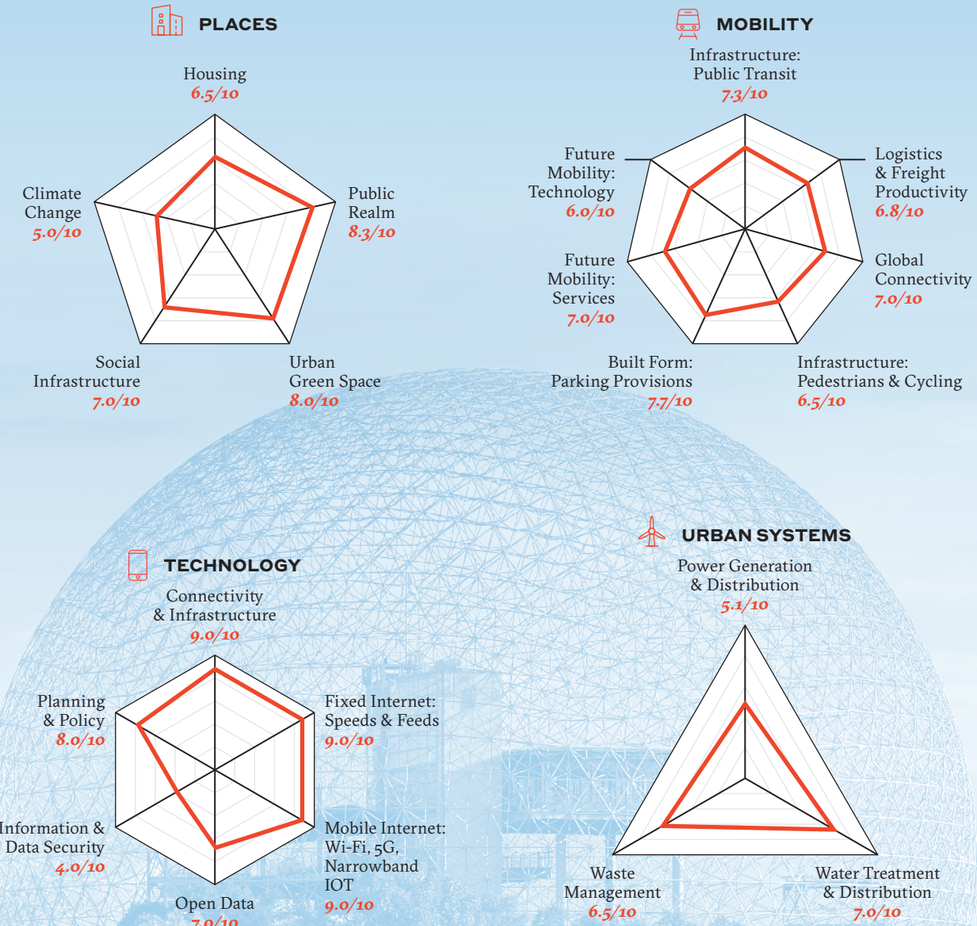
In addition, foreign investment in Montréal reached CAD2 billion in 2017. Talent is widely recognized as the city's new oil alongside a strong economy, great education system and political stability.

In June 2018, the ambitious Montréal Resilient City Strategy was unveiled. It showcases the city's goal to improve its ability to anticipate, prevent and adapt to challenges, in preparing for the stresses and one-off time shocks that might affect the population. Montréal is the first Canadian city to publish a resilience strategy.

With a firm focus on the future, the city has a robust blueprint for increasing mobility and accessibility, expanding the percentage of protected areas, creating more commercial and residential spaces in areas close to transport zones, and supporting social development housing.

Can Montréal climb to the top of the world-leading cities chart?

CITY ASSESSMENT



PLACES
7.0/10

HOUSING

SCORE: **6.5/10**

Montréal has a big student population and people from all over the world are attracted by its European-flavored urban design. This city has one of the best transport systems in Canada. The authorities are looking long-term at improving many aspects of the metropolis, such as housing for every level of income.

By 2031 Greater Montréal is forecast to gain 320,000 new households, 40 per cent of them in Transit-Oriented Development (TOD) areas, to accommodate 530,000 new residents. Most of the growth will come from people aged over 65. According to the Institute of Statistics Québec, 22 per cent of people in Greater Montréal will be 65 or older by 2031, compared with 15 per cent in 2013.

The Metropolitan Land Use and Development Plan (PMAD) envisages social and affordable housing projects playing a key role in 2013 Greater Montréal because they ensure social diversity. In addition, the PMAD lists 32 transit corridors in which the TOD social housing component could be lifted from 40 per cent to as high as 60 per cent.

PUBLIC REALM

SCORE: **8.3/10**

PMAD discusses enhancing pedestrian safety through improved street configuration and protection from vehicular and bike traffic, and by creating and maintaining sidewalks during seasons. It outlines the importance of protecting riverbanks, shorelines and flood plains, in addition to creating vibrant public spaces. The Old Port Masterplan was developed to address the revitalization of the waterfront in the area.

In the Masterplan of the City of Montréal, the creation of vibrant public spaces and the enhancement of existing ones and pedestrian-friendly streetscape designs are part of improving the public realm. The plan also embraces the revitalization of the waterfront and discusses inter-governmental collaboration to enhance the blue network of Montréal and the Montréal Archipelago as a place for people.

URBAN GREEN SPACE

SCORE: **8.0/10**

The PMAD outlines regulations that are conducive to greening, such as alleyways, green roofs and urban agriculture. The plan encourages the planting of trees and flowers as part of sustainable streetscape design, and emphasizes the creation of new parks that support urban biodiversity. The enhancement of the Green and Blue Network was identified as one of its goals to ensure the connection of green spaces and regional parks in Greater Montréal. The PMAD also calls for the protection of the environment and emphasizes urban biodiversity as an indicator of good quality urban life.

The Master Plan focuses on enhancing Mount Royal and the unique character of urban landscapes. In addition, it encourages the preservation and enhancement of the green network of the city and its urban forest, which includes hundreds of regional and urban parks. The Design Guide for Sustainable Streets emphasizes urban canopy and vegetation as part of sustainable and transit-supportive streetscapes to enhance the public realm. A Sustainability Plan for Montréal 2016-2020 and the Policies for the Protection and Enhancement of Environmental Areas were developed to create policies for the conservation of natural heritage.

SOCIAL INFRASTRUCTURE

SCORE: **7.0/10**

The Québec Government has committed CAD8 billion from 2017 to 2027 to maintain and renovate schools in the province. A sum of CAD287m will go to Montréal's five school boards to fund the 414 projects the region has planned for the next 10 years. The funding split is: Commission scolaire de Montréal, CAD191 million; Commission scolaire Marguerite-Bourgeoys, CAD44 million; Commission scolaire de la Pointe-de-l 'Ile, CAD23 million; Lester B. Pearson School Board, CAD16 million; and English Montréal School Board, CAD12.5 million.

Other needs addressed in the plan include:

- Managing obesity rates: CAD3 million in funding allocated to increase physical education infrastructure and teachers in the province
- Promoting equality: The plan has a focus on providing equal opportunities for children in disadvantaged and vulnerable environments
- Preparing students for a digital future: CAD400 million has been allocated in conjunction with the Digital Action Plan for Education and Higher Education to help young students and adults gain digital skills
- Increasing support for students with additional needs: Funding has been provided to hire an extra 7,700 professionals, including remedial teachers and speech language pathologists, to support elementary and secondary education.

Québec has allocated CAD6.7 billion for higher education infrastructure from 2018 to 2028, including upgrades of the construction of infrastructure, replacement of dilapidated furnishings and equipment, and the addition of classes to accommodate the need for more spaces. Nearly CAD200 million has been committed to increase and improve digital infrastructure in conjunction with the Digital Action Plan for Education and Higher Education.

In Montréal, CAD145 million has been allocated to add classrooms and other buildings to accommodate new students in vocational colleges and universities. Québec has allocated CAD8 billion for building new or improving existing health care infrastructure across the province. A total of CAD6.3 billion is being provided for the replacement of existing infrastructure, including CAD4.1 billion for specialized furniture and medical equipment. Lastly, CAD3.1 billion has been earmarked for renovation of existing infrastructures.

The focus for this initiative is the construction, expansion and modernization of hospitals. A major project in Montréal is the building of the new Center Hospitalier de l'Universite de Montréal — a hospital complex in the heart of the city.

Montréal and Québec are focused on providing better access to family doctors, specialists and preventative health care. In the past two years, government planning and funding has resulted in the reduction of diagnostic surgery waiting times, enhanced home and residential care for seniors, and provided access to a family doctor for almost 1.1 million people in the province. To enable this, 1,300 nurses have been hired for long-term care centers and 31 clinics that operate seven days a week have been opened.

In the next two years, the government has allocated CAD1.295 billion to improve access to healthcare, CAD164 million to improve health prevention programs and CAD378 million to improve healthcare for seniors.

A growing concern is a lack of mental health support and care. Québec has addressed concerns about these issues with a five-year action plan. Other efforts include the Autism Spectrum Disorder Action Plan, and the introduction of a new government health prevention policy.

Québec has attempted to make childcare more accessible to lower-income families through a refundable tax credit. This tax credit compensates families for part of their expenses at a rate that corresponds to the yearly family income, starting at 26 per cent for higher income families and rising to 75 per cent for the lowest. Despite this, the increasing costs of childcare inhibit many families. No plans have been announced for the expansion of childcare facilities or the hiring of more childcare employees.

The Government of Québec offers support to cultural infrastructure development projects throughout the province and Montréal gives CAD42.4 million a year to cultural institutions. On top of this is support for several projects to expand, renovate or build new cultural assets in Montréal such as:

- CAD37.7 million support for the expansion of Montréal's Musee d'Art Contemporain, on which construction is about to begin
- CAD2.8 million allocation for the renovation of Bibliotheque et Archives Nationals du Québec
- The Ville de Montréal's library renovation, expansion and construction program, which has been allocated CAD24.5 million to renovate L'Octogone Library.

CLIMATE CHANGE

SCORE: **5.0/10**

The Climate Change Adaptation Plan for the Montréal Urban Agglomeration 2015-2020 recognizes the effects that climate change will have on the city and outlines objectives for climate change mitigation, adaptation and resilience. This plan also identifies built environment, municipal operations and the socio-economic effects that might arise because of climate change. A broader resilience strategy to manage these problems is not detailed. An attractive, competitive and sustainable greater Montréal focuses on land use and quality of life, transportation and the environment in response to climate change.

Sustainable Montréal 2016-2020 has set Greenhouse Gas (GHG) emission reduction targets of 30 per cent by 2020 and 80 per cent by 2050, compared to 1990 levels of GHG emissions. To meet this goal, Montréal plans to reduce its dependence on fossil fuels and therefore reduce GHG emissions.

MOBILITY
6.9/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **7.3/10**

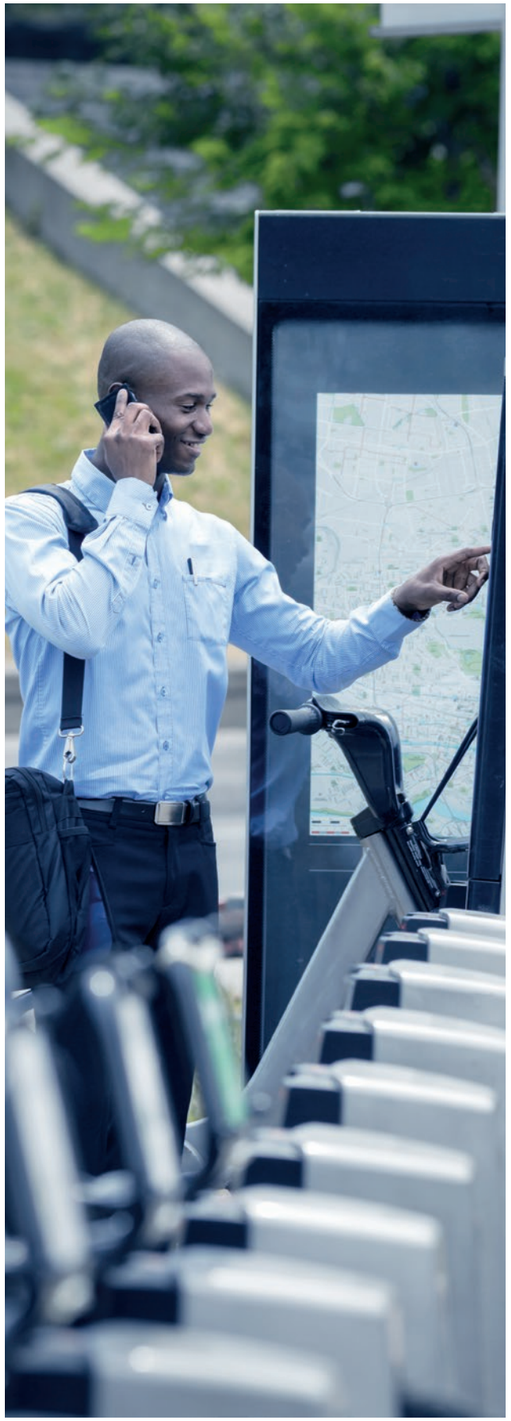
In 2015, Transports Québec announced a reform of metropolitan public transit governance. The number of public transit organizations was cut from 16 to five in a simplification of organizational structures.

The Société de Transport of Montréal (STM), the entity responsible for public transit in Montréal, has published its 2025 strategic organizational plan. This plan aims to improve the efficiency of metro and bus service in areas affected by construction sites, to revise bus network routes and increase its fleet, to make the network more accessible with an adapted service, and to group under the same platform the purchase of tickets of the various mobility services.

Developmental transit projects are also under way, such as the heavy infrastructure project of the Réseau Express Métropolitain, a 67 kilometer automated light rail system that connects the North Shore, the South Shore, the West Island and the Montréal-Trudeau Airport.

In 2008, Montréal adopted a 10-year transport plan, presenting the 21 main strategies that it wanted to realize simultaneously. However, this transport plan has become obsolete and it is time for the City of Montréal to present a new one.

About a year ago, Montréal's first mobility hub was inaugurated near the Square-Victoria metro station, a strategic connection point in the city to provide users with several transport alternatives. This hub increases accessibility and mobility around the city through land-use and transit integration and is part of a plan to shift commuters away from private car use. There are two charging stations for electric cars, parking spaces reserved for self-service electric cars and motorcycles, taxi stands, bike facilities, a BIXI bike-sharing service station and a metro station nearby.



Since October 2017, new Azur trains have been integrated into the Montréal metro network to gradually replace the old MR-63 and MR-73 trains, which are being reused in various urban development projects. In addition, the STM plans to extend the blue line of the Montréal metro system in 2025 and set up a Bus Rapid Transport network on a major axis. While these expansions do not directly shift commuters from private car usage, the increased network capacity will be able to accommodate the transit needs of the growing population.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.8/10**

With its air, maritime, road and rail access, Montréal has an efficient infrastructure network allowing it to be an intermodal freight hub. According to Montréal International's report on attractiveness factors, Montréal is recognized for the efficiency of its market access, border administration, transportation and communications infrastructure, and its business climate.

Freight transportation is an important economic vector for the City of Montréal and is a natural fit with the Metropolitan Economic Development Plan 2015-2020 of the Montréal Metropolitan (CMM), which offers strategic directions for economic development. CMM also provides financial support to newly created industrial clusters including information and communications technology, clean technology and logistics and transportation.

In 2012, the Montréal Metropolitan Logistics and Transportation Cluster (CargoM) was launched. By bringing together all the players involved in research, logistics and the transportation of merchandise, CargoM aimed to make Montréal a more attractive and recognized transit operation platform. CargoM is part of the Metropolitan Economic Development Plan 2015-2020.

Québec's Sustainable Mobility Policy provides financial assistance programs to maintain the infrastructure of freight transport networks on a provincial scale.

GLOBAL CONNECTIVITY

SCORE: **7.0/10**

Aeroports de Montréal plans to expand its Montréal-Trudeau Airport terminal facilities as part of its 2013-2033 Master plan to cater for growing freight transport demand and passenger traffic expected to reach 22 million in 2033.

The Port of Montréal is booming. In 2015, the port set two records for the quantity of goods handled and cruise ship passengers alighting in the city. Strategic measures are in place to meet the growing demand and a program to support investment in maritime transport infrastructure is available.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.5/10**

As part of its Vision Zero, the City of Montréal developed, with partners from the public and private sectors, cycling city policy that included short- and medium to long-term measures aimed mainly at an expansion of the cycling network. The goal has been achieved with nearly 850 kilometers of cycle lanes, safer street layouts for cyclists and pedestrians and better accessibility.

Although Montréal does not have a complete streets policy aimed at universal accessibility and the safety of active modes (bike and pedestrians), it plans traffic-calming measures. No action plan is dedicated to end-of-trip facilities, but several companies are encouraging active transportation by developing such facilities.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.7/10**

The parking policy developed by the City of Montréal aims to redefine dedicated space by considering the environmental impact of on-street and off-street parking (urban heat island) and the willingness of citizens to reduce their private vehicle dependency.

The policy revises this space by proposing sustainable mobility poles, new pricing, a city center parking optimization for economic vitality, a public transport service harmonization, a better sharing of the street, dedicated parking spaces for the BIXI bike-sharing service and real-time information system integration.

The action plan is well-developed and presents implementation strategies, including the revision of the regulatory framework and strategic measures.

FUTURE MOBILITY: SERVICES

SCORE: **7.0/10**

Montréal is a city of choice for the implementation of new mobility services. There are car-sharing (Communauto, Car2Go), bike-sharing (BIXI) and carpooling (Netlift) companies that have been growing in recent years.

However, there is no plan or policy specifically dedicated to the integration of these services. STM is already undertaking integration measures for various mobility services under the OPUS card (STM, BIXI, Communauto) and would like to collaborate with taxi services to offer users a varied combination of modes of transport.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **6.0/10**

The City of Montréal aims to become the North American leader in transportation electrification and sustainable mobility by 2020. In the past few years, several efforts have been made to streamline and refine transport in Montréal. These include the development of the 2016-2020 Transportation Electrification Strategy, Velo-Transit Pilot Project, an electric bike sharing initiative that aims to reduce road traffic and use sustainable forms of transit, and the Montréal City Mobility Project, in collaboration with Nova Bus, the STM and other partners that aims to electrify bus lines.

Montréal's 2016-2020 Transportation Electrification Strategy calls for the creation of the Institute of Electrification and Intelligent Transportation, the electrification of the STM network, the introduction of self-service electric vehicles, increasing the electric terminals network and the application of a parking policy for electric vehicles.

At the same time, the Québec Government is offering financial assistance programs for electric vehicle purchase and is introducing preferential measures for electric vehicle users through its Roulez Electrique program.

Driverless cars and drone technologies are considered worthy of further investigation without firm strategy or implementation.

TECHNOLOGY
7.7/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **9.0/10**

In 2016, Montréal was named Intelligent Community of the Year by the Intelligent Community Forum. It was recognized for its innovative use of information and communications technologies to create economic prosperity by addressing social issues and enhancing quality of life, in part by improving transportation and mobility. Montréal created the Smart and Digital City Office in 2014 and has initiated 70 projects through the 2015-2017 Montréal Smart and Digital City Action Plan.

Already recognized for its vitality in the field of digital technologies, Montréal aims to become a world leader among smart and digital cities. Connectivity and digital infrastructure are identified as priority actions.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **9.0/10**

Modern telecommunications services are fundamental to Canada's future economic prosperity, global competitiveness, social development and democratic discourse. Fixed and mobile wireless broadband internet access services are catalysts for innovation and underpin a vibrant, creative, interactive world that connects Canadians across vast distances with the rest of the world.

One of the primary providers in Montréal has committed to expanding its fiber optic internet network to more than one million homes and businesses across the city by 2022. The Canadian Radio-television and Telecommunications Commission (CRTC) regulates the fiber and wireless companies to ensure access to these services across the country.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

Montréal has expanded its free wireless internet network for the public to a total of 825 access stations, including existing access zones that have been integrated. Industry Canada, now known as ISED (Innovation, Science and Economic Development), is preparing for additional spectrum auctions to support 5G and other mobile evolutions. The Governments of Canada, Ontario and Québec have partnered with some of the world's digital heavyweights to work towards the next generation of wireless technology. A new project, ENCQOR (Evolution of Networked Services through a Corridor in Québec and Ontario for Research and Innovation), will create a 5G wireless corridor through the two largest provinces in Canada to support the growing network of physical devices, vehicles and other objects that are increasingly communicating directly with each other. This project will allow an estimated 1,000 small and medium businesses to plug into an early 5G platform for research and development.

OPEN DATA

SCORE: **7.0/10**

The city has developed an open data policy that serves as an administrative document to define open data governance and responsibilities for its use. An open by default approach was elected for the policy, whereby all data collected or acquired by the city is considered open, with certain exceptions for reasons of privacy and public security. A shared open data portal for the Government of Québec and the province's municipalities was launched in April 2016. By the end of 2018, more than 800 data sets will have been released. However, this portal is currently only available in French (an English version is under development).

INFORMATION AND DATA SECURITY

SCORE: **4.0/10**

The City of Montréal has published its commitment to data confidentiality and security on its website, in accordance with the provincial and federal acts. The Province of Québec has enacted the Act Respecting the Protection of Personal Information in the Private Sector to exercise the rights of the Civil Code that relate to the protection and use of personal information.

This Act also deals with the rules for protecting the confidentiality of personal information and the necessary security measures required to ensure that all personal information is protected when retained or otherwise destroyed. The Province of Québec has also enacted legislation dealing with respecting Access to Documents held by Public Bodies and the Protection of Personal Information to govern the use of personal information.

Canada's Federal Government legislated to govern the use of all personal information collected by the federal government and the rights Canadian citizens have in accessing information that has been collected. Also, the Federal Government has enacted the Personal Information Protection and Electronic Documents Act to, "govern the collection, use and disclosure of personal information in a manner that recognizes the right to privacy of individuals with respect to their personal information and the need of organizations to collect, use or disclose personal information for purposes that a reasonable person would consider appropriate in the circumstances".

PLANNING AND POLICY

SCORE: **8.0/10**

The planning and policies for facilitating or commissioning communications infrastructure across Canada are regulated on a federal level. The CRTC is the organization that regulates and supervises broadcasting and telecommunications in the public interest. It has a three-year plan that outlines the key activities until 2020, the annual study of telecommunication services in Canada and the Telecom Regulatory Policy CRTC 2016-496 that applies countrywide. Because of the exclusive federal jurisdiction in Canada, Montréal has a limited role in influencing planning and policies.

URBAN SYSTEMS
6.2/10

POWER GENERATION AND DISTRIBUTION

SCORE: **5.1/10**

Montréal's plans to address renewable energy technologies and infrastructure in the future is undecided. In any case, Québec is already producing 97 per cent of its energy from renewable sources, primarily from hydroelectric power. Sixty per cent of Québec's clean energy sector jobs are in Montréal, making it a hub for renewable energy production, research, and education.

Montréal supports many companies operating in renewable energy sectors including hydroelectric power, biomass, wind power, and solar power. In fact, Québec has the highest potential for wind power across North America and has produced innovation and research in the wind power sector.

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.0/10**

Montréal Durable 2016-2020, is a program that prioritizes reducing drinking water consumption and stormwater management. The City of Montréal has a regulation regarding water usage and sustainable water management. For example, the use of cooling systems that utilize potable water and do not have a closed recirculation system have been forbidden from January 2018. The city promotes the reuse of stormwater to reduce storm runoff from urban areas and decrease the demand on potable water. These standards require municipalities to reduce or not increase their spills to the natural environment if they wish to carry out developments. In case of developments, the municipality must prove by the overflow management plan that the overflows will not be increased by them. Desalination is not required in Montréal as freshwater sources are sufficient for the region.

Since 2004, a Water Fund program has been used to coordinate the financing of the long-term water infrastructure rehabilitation program in the Montréal region. Massive investments are required. This includes the water treatment plants as well as the distribution network. There are several projects for water treatment innovation and upgrade, but biogas and energy recovery are subjects that have recently started to appear.

The Saint Lawrence River, being the main freshwater source for the city, is constantly being monitored at four locations for its quality, in terms of toxic substances. The St. Lawrence Action Plan 2011-2026 was developed to improve the water quality at the source.

WASTE MANAGEMENT

SCORE: **6.5/10**

Montréal already has waste separation and recycling infrastructure and plans to increase recycling through instituting organic waste collection in many of its buildings and implementing two- or three-way waste collection in high-usage public spaces.

The city does not have any plans involving the remediation of landfills.

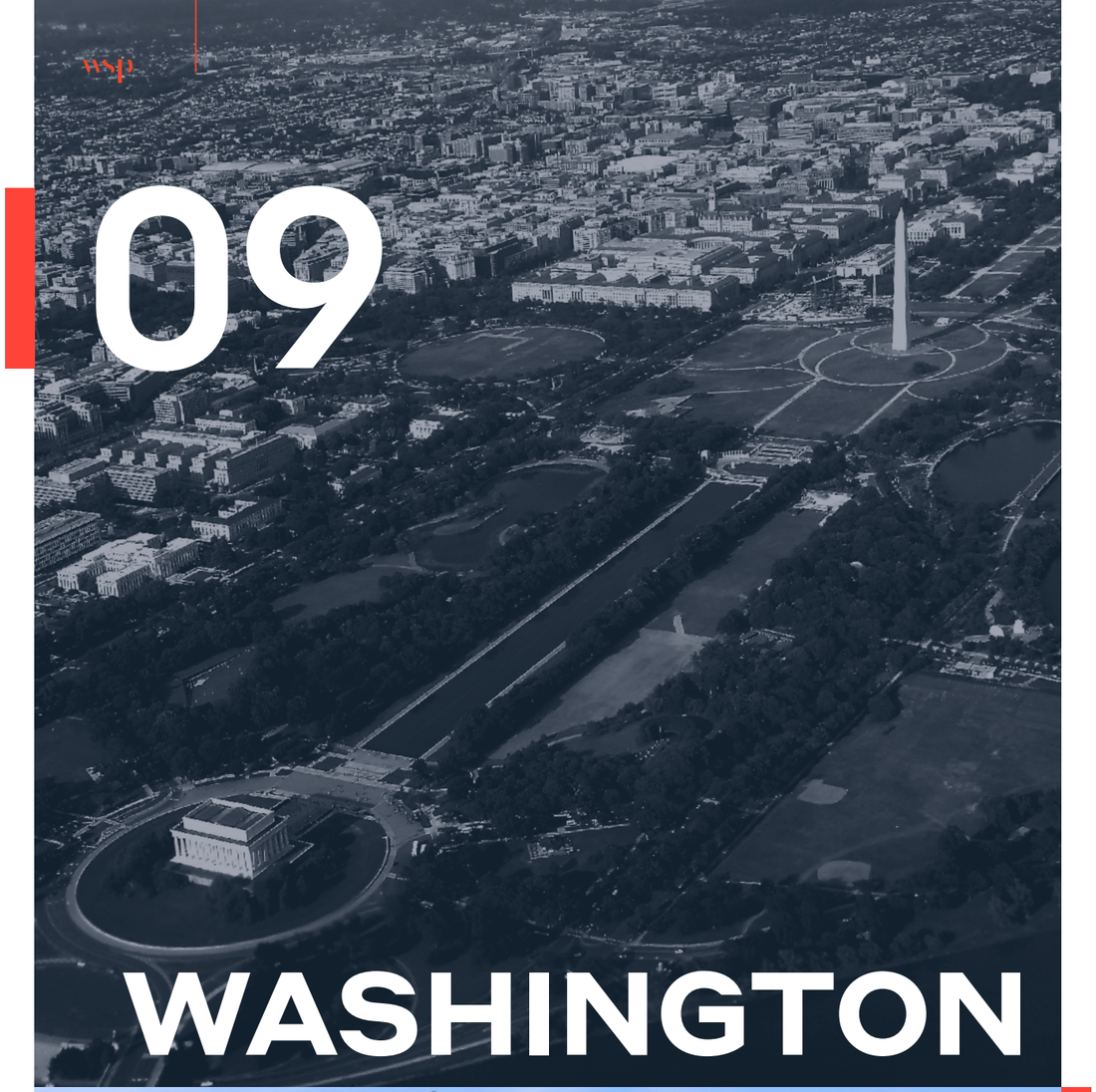
Montréal plans to implement source waste reduction measures, such as banning single-use water bottles in all municipal buildings and installing more water fountains, replacing No. 6 plastics in Montréal food banks and introducing paper saving programs.

Montréal plans to recover 80 per cent of recyclables and organic materials, household hazardous waste, construction, renovation, and demolition waste and bulky refuse by 2019, as stipulated in the Municipal Waste Management Masterplan. It is committed to building two anaerobic digestion centers, two composting centers and a pilot center for the pre-treatment of organic waste.

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09

WASHINGTON DC



Some call it the political capital of the world. Washington, DC is not just the United States of America's capital and the seat of the Federal Government. It is the global base for international institutions such as the International Monetary Fund, World Bank, Human Rights Campaign, and International Finance Corporation, as well as being home to 177 foreign embassies.

A compact city of 69 square miles, Washington, DC's prominence on the global stage belies the growth, change, and development evident at the local level to its nearly 700,000 residents.

In addition to the influence of federal and international institutions, Washington, DC's local agencies and private firms have undertaken and advanced substantial growth and change within the District over the past several decades with progressive planning and targeted investment and development, both driving and responding to a changing population. Designing and implementing policies, plans, and public spaces that both support and protect a changing demographic of residents - notably, the district has a lower median age than each of the 50 states - and a substantial number of tourists will remain a key charge as Washington, DC looks to its future growth and resilience.

While Washington, DC's reputation is globally driven by its image as a political powerhouse, it is also rich in local, national and international cultural assets, including museums, memorials and monuments and educational institutions. Established in 1846, the Smithsonian Institution is a consortium of museums and research centers administered by the US Government "for the increase and diffusion of knowledge". The public has free access to the Smithsonian's 16 museums, nine research centers and the national zoo.

AT A GLANCE

RANKED **09**
CITY SCORE **27.71**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.1/10	**6.2/10**	**8.3/10**	**6.1/10**

Many other public and private museums further enrich the capital city, which draws close to 20 million visitors each year – close to 30 times the number of residents.

A growing, diversified economy has resulted in a low unemployment rate and high per capita GDP in the Washington, DC metropolitan area. The Federal Government accounts for almost 30 percent of jobs in Washington, DC, with many more residents employed in organizations that do business with it. However, the district is experiencing growth in industries not directly related to the government, particularly in fields such as education, finance, and scientific research. As of mid-2018, the District has an unemployment rate higher than the national average at 5.6 percent (compared to 3.9 percent nationally).

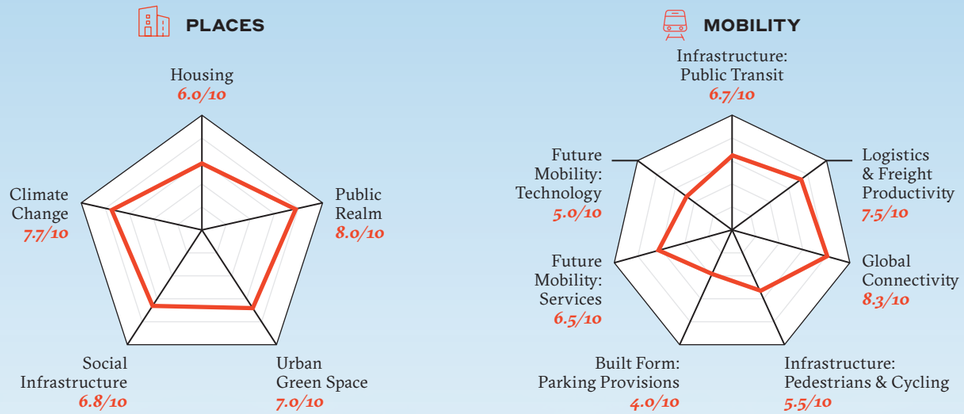
Since its foundation, Washington, DC has grown around a carefully-planned city grid of neighbourhoods and commercial centers, a core of government buildings, and connected corridors of large open spaces and public parks. Bounded by Virginia and Maryland, Washington, DC's projected growth to nearly one million residents in the next thirty years will demand a strategic, comprehensive approach. Planning for this growth while preserving the character that makes Washington, DC unique, provides affordable housing, and invests in high-quality transportation.

Washington, DC's growth necessitates increasing density, in-fill development and vertical construction. This growth is supported — and shaped — by the Washington Metropolitan Area Transit Authority (WMATA), a comprehensive system of rail, bus, and paratransit in the metropolitan area. WMATA Metrorail is the third-busiest rapid transit system in the US, with about 180 million trips a year on its 188 kilometers of track.

In recent years, WMATA has confronted its aging system's high level of major maintenance to improve safety and reliability on both its rail and bus systems. Billions will be needed in the next 10 years for the 50-year-old system. Capacity limitations are appearing as demand continues to grow. Thirty-eight percent of households in Washington, DC are car-free and an impressive 88 percent of all new households in 2014 did not have a car. City and regional planners must consider how this trend will affect growth and mobility demands.

The Federal Bureau of Investigation, Central Intelligence Agency, Department of Homeland Security, and Metropolitan Police Department work to keep residents and visitors safe through leading technology, preventative infrastructure, and deterrents range from building codes to restricted air space.

CITY ASSESSMENT



PLACES
7.1/10

HOUSING

SCORE: **6.0/10**

The DC Office of Planning guides development, preserve and revitalizes neighbourhoods, and advances the District's strategic goals by performing planning for neighbourhoods, corridors, districts, historic preservation, public facilities, parks and open spaces, and individual sites. The department has taken a long-term view of future growth and development, comprehensively planning on a 20-year horizon for land use, economic development, housing, environmental protection, historic preservation, and transportation. Washington, DC has a robust and comprehensive assortment of documents, policies, and programs that guide land use planning and place-making.

Rapid population growth, increasing per capita income, and gentrification, are intensifying housing pressures in the region. In 2018, Washington, DC was among the top three markets in the country for apartment construction, with approximately 29,000 units under construction on top of the 13,000 units added over the past year. As the city grows by nearly 1,000 residents a month, access to affordable housing for new and long-time residents is a major concern, both in the rental and ownership markets, as most these units tend to be high-end. Further, most new rental developments are clustered in two areas – H Street corridor/NoMA and Southwest/Navy Yard. Recent data suggests that monthly housing costs account for at least a third of household income for almost half of all rental households in Washington, DC.

Four key factors are driving housing trends in Washington, DC. First, an influx of affluent singles and couples are putting extra pressure on the undersupply of affordable housing for low- and middle-income families. Second, restrictive land use policies have contributed to the undersupply of uniform housing stock (e.g., there are an insufficient supply of housing units that are both affordable and can accommodate a family of four). Third, public investments and amenities for communities east of the Anacostia River has lagged, which is where most of the affordable housing is found.

In 2016, the mayor made a commitment to invest CAD130 million a year in the Housing Production Trust Fund (HPTF) to expand and preserve affordable housing.

This special revenue fund provides gap financing for projects affordable to low- and moderate-income households. As a result, about 9,000 affordable housing units have been produced using HPTF since 2001. Further, HPTF requires covenants to be placed on properties to keep them affordable (generally 15 years for owner units and 40 for rental units).

In 2015, the Urban Institute published the Affordable Housing Needs Assessment for the District of Columbia, which documented housing needs, recent trends, projected population and housing stock changes, and funding needs and challenges.

The DC Office of Planning collects and organizes data and information about housing and development in the District of Columbia from a variety of sources to help cater for predicted population growth. It considers the issuing of building permits, home price index, purchasing power/median sales price, and development activity database.

Development height restrictions detract from the district's ability to fully enable and encourage compact development. An 1899 Act that established no building could be taller than the Capitol (88 meters) was amended in 1910 to restrict building heights further. They were to be no more than six meters taller than the width of the street they faced to preserve the light and airy character that Thomas Jefferson envisioned for the city. This law holds today, with a few exceptions on Pennsylvania Avenue. This results in a human-scale city, mostly devoid of large surface parking lots because the value of land is so high. However, it also artificially raises rents downtown by constraining vertical, compact development.

The Department of Consumer and Regulatory Affairs has housing code standards that define safe, habitable, livable conditions landlords must provide to all tenants. There are standards for ventilation, temperature control, safety and security, and structural integrity.

PUBLIC REALM

SCORE: **8.0/10**

Parks and public space play an important role in recreation, aesthetics, neighbourhood character, and environmental quality for any modern city. The National Mall and Memorial Parks in Washington are home to some of the United States' most beloved public spaces. The long, grassy National Mall is home to iconic monuments, such as the Lincoln Memorial and the Washington Monument, with the Capitol to the east and White House to the north, respectively.

It is also flanked by Smithsonian museums, and the nearby Tidal Basin is encircled by spectacular blossoming cherry trees and paths well-used by tourists and local joggers alike. However, smaller, less known public spaces also abound throughout the district, providing gathering spaces for communities and a refuge from the city's bustle.

Washington, DC provides multiple public golf courses and a wide variety of sports facilities to its residents. The careful public and private investments in sports and recreational avenues have helped the District achieve economic growth at a faster rate in the last 10 to 20 years. The 20,674 seat Capital One Arena (formerly Verizon Center) is one of the many examples where private investments helped attract others big developments (the Walter E. Washington Convention Center). A report prepared by Downtown DC Business Improvement District (BID) identified that after its construction in 1997, Verizon Center contributed to an accelerated development in the neighbourhood, producing additional 52,739 jobs between 1995 and 2013.

The District Department of Transportation (DDOT) produced a Public Realm Design Manual in 2011 with guidelines for roads, sidewalks, parks, plazas and other open spaces that comprise of the arteries and focal points of the urban framework. The goal of this manual was to foster a public realm that is safe, sustainable, and enriching. Today, regulations cover everything from the width of travel lanes to sidewalk cafes while encouraging architectural variety and landscaped areas to create a parkway character.

The Office of Planning's work in urban design includes a series of projects and initiatives to promote the creation of great places and amenities, the preservation of urban excellence in building facades, and site and project design that respond to neighbourhood scale and context. Plans are also in place to redevelop the Robert F. Kennedy (RFK) Stadium into multi-purpose athletic field and transform the giant parking lots into urban green spaces. It is expected that the construction on the RFK Stadium site will begin in fall 2018.

The Office of Planning has partnered with the District Department of Parks and Recreation on master planning and facility planning services for district-controlled parks. However, the district controls less than 26 percent of parkland in the city because most of it is under federal jurisdiction. Starting with CapitalSpace in 2006, the Office of Planning has worked with federal partners, including the National Park Service and the National Capital Planning Commission, to create a unified vision for the district's park system.

Recent efforts have focused on restoring Washington, DC's waterfront and developing it into vibrant destinations characterized by public spaces and parks. The Southwest Waterfront along one mile of the historic Washington Channel is now home to a new mixed-use development called the Wharf, which includes piers and waterside promenades, marinas, recreation activities, markets, restaurants and other developments. On a smaller scale, the District transformed the riverfront along the Potomac at the bottom of Georgetown from a salt truck storage facility to a public park and walking/jogging trail. Similarly, the 1,754-acres Rock Creek Park offers an oasis during spring and fall for hiking, fresh air, and meditation.

Simultaneously, the DC Department of Energy and the Environment has engaged in projects aimed at restoring habitats and waterways. While many smaller projects focus on tributary streams, major efforts have targeted the Potomac River and the Anacostia River. An interstate commission on the Potomac basin continues to funnel funding, research, and education toward restoring the river, while the Anacostia Watershed Restoration Partnership comprises federal, state, and local government agencies dedicated to re-establishing the river's original ecosystem.

URBAN GREEN SPACE

SCORE: **7.0/10**

The availability of green space in cities plays a vital role in shaping neighbourhood character and environmental quality and preserving biodiversity. At the same time, it provides recreational opportunities to residents. With 3,075 hectares of permanent open space, Washington, DC has one of the highest park areas per resident ratios in the US although 85 percent of it is under federal jurisdiction.

The Comprehensive Plan of 2006 (updated in 2011) is the guiding document for preserving and expanding green space in the district. It emphasizes partnering with various stakeholders to maximize assets. To further this objective, CapitalSpace was created as a consortium of the DC Department of Parks and Recreation, the National Capital Planning Commission, the National Parks Service and the DC Office of Planning.

CapitalSpace's comprehensive plan (updated in 2018) laid out the policy framework to collaborate with federal authorities in conserving urban parkland. The strategy contained six big ideas, probably the most prominent being to link the Fort Circle Parks by implementing a greenway and making the parks a destination. At the private-sector level, the newly opened Audi Field announced various "green initiatives" to improve the experience for the audience, including recycling, food waste composting, educational materials, and staff training.

While the Urban Forestry Administration oversees standards and specifications for tree removals, plantings, and protection methods, DDOT integrates this information in its projects through the Public Realm Design Manual. The non-profit organization Casey Trees has been restoring, enhancing and protecting the tree canopy in Washington, DC since 2002. In the past 15 years, more than 80,000 trees have been planted citywide in a bid to reach the district's 40 percent canopy goal by 2032.

Policies are in place that focus on stormwater runoff through landscaping and enhancements to public space design that maximize permeable surfaces. Washington, DC is increasingly implementing a variety of stormwater management techniques in tree pits in the public right-of-way. To preserve the green infrastructure, the DC Water and Sewer Authority has developed a long-term control plan to prevent sewerage overflows.

The authority is considering how some district codes and ordinances related to sidewalks and streets can be modified to mandate green infrastructure retrofit requirements.

The Department of Energy and the Environment sets the Green Area Ratio (GAR), an environmental-sustainability zoning regulation that sets standards for landscape and site design. By increasing green space, the GAR aims to produce cooler temperatures, improve air quality, and reduce stormwater.

The District of Columbia Green Financial Incentives programs targets green roofs, shade trees, stormwater retention and rain gardens. Rebates and incentives range from CAD65 to CAD1,300.

SOCIAL INFRASTRUCTURE

SCORE: **6.8/10**

DC Public School (DCPS) has 48,555 students from pre-kindergarten to grade 12 enrolled in 115 schools. The student to teacher ratio in the DCPS system is 1:13, which is better than the national ratio of 1:16. Historically, public schools in Washington, DC have grappled with under-funding. The DCPS school system has had one of the lowest graduation rates in the country.

In 2017, the graduation rate was 73 percent and 26 percent of students who started their freshman year with the class of 2018 have withdrawn or transferred out of the DCPS system.

There are 103 private schools in Washington, DC and they serve about 17 percent (18,782) of total students.

In 2007, Washington, DC passed a law that gave the control of its public schools to the Mayor. Each year DCPS works with the Mayor to finalize funds for modernizing and updating the school infrastructure under the Capital Improvement Plan. The plan is then sent to the City Council for approval.

Higher education in DC offers diverse fields of study through public and private institutions. Washington, DC is home to the American University, the George Washington University, Howard University, University of the District of Columbia and a dozen other institutions of higher education. Some of these universities have released master plans that aim to contribute towards the overall growth of the district and the metropolitan region.

The district is served by 14 public and private hospitals that are open to the public and two military hospitals (Walter Reed Army Medical Center and the Washington DC Veterans Affairs Medical Center).

The DC Department of Health developed the Health Systems Plan in 2017 with the main aim of removing disparities in healthcare. In 2018, a triage nurse was added to the 911 dispatch system to help callers decide whether they should go to an emergency room. The nurse is also able to place callers with non-emergencies in more appropriate care. This program is aimed at reducing the high volume of non-emergency medical requests that overwhelm the 911 system, and will reserve ambulances and medics for true emergencies.

The Department of Health has a comprehensive program for early childhood care. Initiatives such as the In Home Parent Education Program ensure primary childcare education for parents through funding to community organizations. About 10,000 children are born each year and there is a growing influx of millennials in their childbearing years. The Deputy Mayor for Health and Human Services has acknowledged that the city is not meeting needs and demands. The cost of childcare in the district is extremely high and serves as a major barrier for many working parents. DC leaders have begun implementing a variety of plans to make childcare more accessible and affordable. This financial year's budget includes CAD16.3 million towards a plan to create 1,300 new slots for infants and toddlers.

Being the political center of the country, Washington is a major cultural and historical destination. It has a huge network of museums, galleries, art spaces and other cultural assets. DC has a distinct organizational structure for cultural institutions; most of them are operated through the Smithsonian Institution. Smithsonian consists of 17 museums and galleries and provides state-of-the-art research on social and political history in a local and global context.

Some of the most renowned museums under Smithsonian Institution include the National Museum of African American History and Culture, the National Museum of American History and the National Air and Space Museum.

Various plans have been introduced and implemented to expand the cultural assets of the city and to engage broader audience. The three key plans in recent years include the Smithsonian 5-Year Strategic Plan (2022), the DC Cultural Plan, and Creative Capital: The Creative DC Action Agenda. These plans highlight various new initiatives and funding mechanisms are planned to enhance the district's creative economy. The 2018 DC Cultural Plan puts the focus on arts, culture and heritage in all neighbourhoods of the city by supporting local talent.

CLIMATE CHANGE

SCORE: **7.7/10**

Washington already experiences growing climate change effects, including more severe storms and hotter temperatures. The District also anticipates that unmitigated climate change will destabilize social, economic, and ecological systems across the planet.

As such, DC seeks to mitigate climate change risk by preventing a two degrees Celsius warming of the planet. To accomplish this, the district set the following goals in its 2013 Sustainable DC Plan:

- Reduce GHG emissions by half by 2032 and 80 percent by 2050
- Reduce energy use by half by 2032
- Increase the use of renewable energy to make up half the energy supply by 2032.

While additional discussion of these goals can be found within the Urban Systems section, the District Department of Energy and Environment conducted a 2014 study to quantify climate change risk and identify mitigation strategies. This study also considers how to reduce Greenhouse Gas (GHG) emissions over three planning horizons, 2020s, 2050s, and 2080s.

The 2016 Sustainable DC Plan Update shows considerable progress towards reducing GHG emissions. Between 2006 and 2013, the district emitted 2.3 million fewer tons of carbon dioxide equivalent emissions, or a 23 percent reduction.

Through its Climate Adaption Plan, the district aims to cope with extreme climate change impacts such as hotter temperatures. The District Department of Energy and Environment has also partnered with city organizations in the city to advance the process of continuous climate change assessment and complete action plans identified in the Climate Change Adaption Plan. For example, it has partnered with C3 Living Design Project to use RELi, a tool that helps assess resiliency on social, economic and environmental fronts.

DC Water has adopted various plans to address Combined Sewer Overflows (CSO) into the Anacostia and Potomac Rivers. The iconic project in this regard is "Clean Rivers" which has reduced the system-wide CSO volume by 96 percent. As part of DC Water's Clean River Project, the First Street Tunnel was completed in October 2016 to mitigate sewer flooding in the District's historic neighbourhood of Bloomingdale.

MOBILITY
6.2/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.7/10**

By one measure Washington, DC was ranked the 18th most congested city in the world last year. Commuters rely heavily on Metrorail and bus to get to work; 45 percent of commuters use mass transit. Almost three-quarters of workers in Washington, DC come from outside of the district.

DC's Metrorail, bus, and mobility services are provided by the WMATA, which also serves Maryland and Virginia. The DDOT also operates a bus system and streetcar line in DC.

WMATA is working to improve the safety and reliability of the Metrorail system and is undergoing large-scale rehabilitation work through the SafeTrack accelerated track repair program.

Washington Union Station is the city's primary hub, with commuter rail and Amtrak passenger rail terminating at the station. It is a major stop along Amtrak's Northeast Corridor service. Northeast Regional trains and the Acela high-speed rail line terminate in the District. WSP developed the Master Plan for Union Station.

Commuter rail lines connect commuters living in the greater Washington metropolitan area to DC. MARC commuter rail runs a daily service to and from Maryland and West Virginia and has three lines terminating at Washington Union Station. VRE commuter rail runs daily services between northern Virginia and Washington, DC.

DC has a strong multimodal long-range transportation plan, We Move DC, created by DDOT in October 2014 and establishing goals that extend across levels of government within the District.

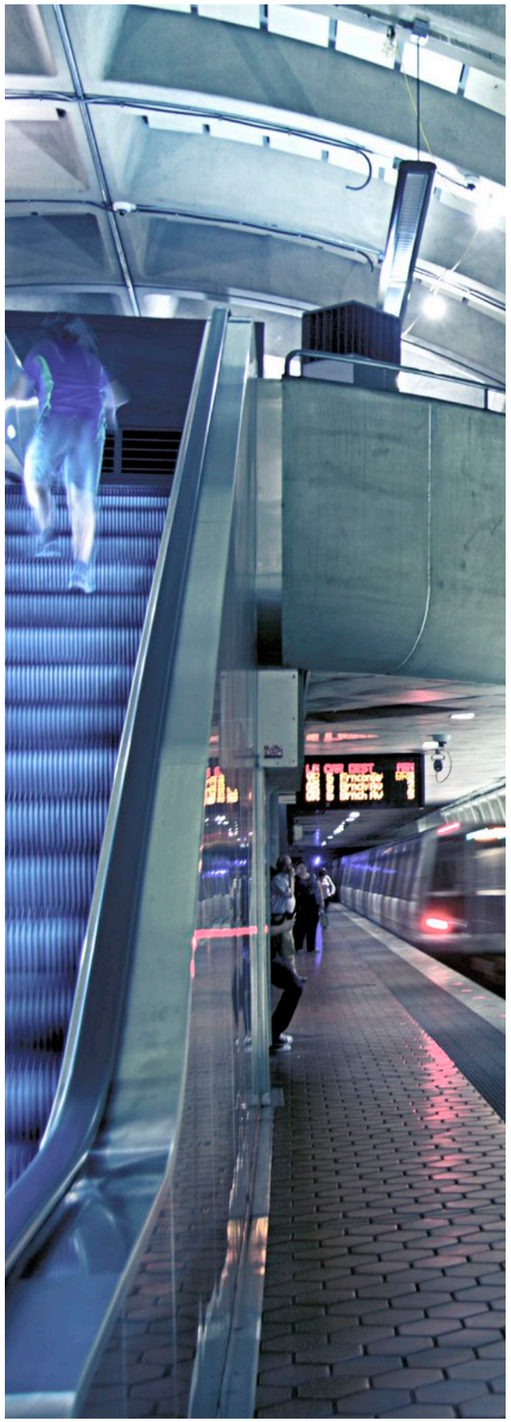
We Move DC lays out objectives to update DC's laws, regulations and policy documents based on transportation goals.

The plan provides objectives for mobility improvements within each geographic area of the city and details how improvements to transit, pedestrian, bicycle and vehicular infrastructure will be implemented in coordination with other departments.

In addition to DDOT, the Metropolitan Washington Council of Governments has plans that lay out long-term priorities for as much as 35 years.

The DC Department of Planning does not have a transit-oriented development (TOD) plan or policy to coordinate and incentivize development around Metro stations or other transit hubs. In fact, the DC Zoning Code does not have a use category for transit-oriented development. However, WMATA has worked on several TOD projects to directly connect buildings to transit stations and build over station areas. Private developers have also built TOD projects in the District to strengthen the density around transit stations.

The DC Department of Transportation has conducted many transportation studies on corridors in the city that integrate land-use considerations into plans for transit, motorist, bicycle and pedestrian infrastructure. Other plans look at the integration of specific transit modes on land use as part of the planning process. The DC Office of Planning's Streetcar Land Use Study assesses the benefits and challenges of building a streetcar system in the city from both a land use and transportation perspective.



DC's long-range transportation plan emphasizes modal diversity in planning for transportation system improvements in the district. Every street should accommodate multiple modes, prioritizing pedestrians first and integrating either protected bicycle facilities, dedicated high-capacity surface transit lanes, dedicated freight routes or a combination of these modes.

The transit plan includes expanding commuter rail service, building new streetcar lines, introducing a new water transit service within DC and between DC and neighbouring jurisdictions and expanding the bicycle network within the city and between neighbouring jurisdictions.

DC's only existing high-speed rail connection is Amtrak's Acela line, which operates on the Northeast Corridor between DC and Boston at speeds up to 240 km/h (150 mph) and stops in Baltimore, Philadelphia, New Haven and New York City.

A new high-speed rail connection between DC and Richmond is undergoing environmental evaluation. This DC-Richmond rail segment is part of the larger Southeast High Speed Rail project, which will include high-speed rail connections from DC to Jacksonville, Florida, with stops in major cities in North Carolina, South Carolina and Georgia.

Preliminary discussions about a Maglev system connecting DC and Baltimore have taken place.

One of the primary goals of DDOT's Multimodal Long-Range Transportation Plan is to increase neighbourhood accessibility and connectivity. The plan stresses increasing high-capacity transportation options throughout the city and ensuring that transit modes connect to each other to achieve this goal.

DC transit systems use contactless ticketing through the SmarTrip card, a rechargeable card used to pay Metrorail and local bus fares that is integrated with transit systems throughout the region. SmarTrip cards can be used throughout the Washington, DC metropolitan area on a host of transit services. This contactless and integrated system eases commuting across jurisdictions and reduces boarding times by moving away from cash payments to cards that are loaded with value at kiosks.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.5/10**

The 2017 DDOT Freight Plan provides recommendations and performance metrics for freight infrastructure and logistics in Washington, DC. Many of the ongoing and short-term projects in this plan are funded through DDOT and FAST Act freight funds. Freight in DC is transported via highway, rail and air, with highways being the dominant mode. Highways connect freight to rail and air freight hubs in and around DC. While DDOT's plan mentions these multi-modal connections, it does not have plans for creating a multimodal freight hub.

Washington, DC is within 64 kilometers of the Port of Baltimore, which was one of the top 10 ports in the US for dollar value of cargo last year. It ranked first in handling automobiles, light trucks, farm and construction machinery, because of the Midwest's auto manufacturers. The expansion of the Panama Canal led to a substantial increase in container traffic in the Port of Baltimore because larger ships from Asia are now able to pass through the canal and dock in Baltimore's deep waters.

Several projects in DC address the National Gateway project's goals to remove tunnel and other overhead clearance restrictions to allow double-stack train movements between the Mid-Atlantic and the Midwest. The Virginia Avenue tunnel is currently under expansion to allow double stacking. WSP performed environmental work on this project.

The District Freight Plan recommends conducting a pilot off-peak delivery program in which deliveries are constrained to the period between 7.00 pm and 6.00 am to reduce traffic congestion and delays associated with freight deliveries. DDOT has developed a map with optimal routes for freight trucks traveling through the district and surrounding region. However, the District Freight Plan suggests that freight trucks often do not obey the routes and restrictions in place, which leads to problems with congestion and safety. The plan indicates that DDOT would benefit from a greater understanding of the way shippers use the transportation system and its corridors so they can create a shared system for passengers and freight.

The District Freight Plan also recommends using a Dynamic Truck Routing system based on real-time traffic conditions to take freight trucks through the District. DDOT has already taken steps to implement this system, but still needs to share routing preferences with shipping companies. DDOT is also looking to require carriers to follow designated routes as part of their annual permits.

GLOBAL CONNECTIVITY

SCORE: **8.3/10**

Three airports serve Washington, DC — the Ronald Reagan Washington National Airport, Baltimore/Washington International (BWI) Thurgood Marshall Airport, and Washington Dulles International Airport.

Almost all international flights depart and arrive from the latter two, both of which are more than 40 kilometers from downtown DC.

Ronald Reagan Washington National Airport handled 23.90 million passengers in 2017. It is only eight kilometers away from downtown DC in Arlington, Virginia, but is unable to accommodate many international flights because of federal limits. The only scheduled international flights allowed to land at the airport are those from airports with US Customs and Border Protection pre-clearance facilities.

BWI, almost 50 kilometers north of Washington in Maryland, handled 26 million passengers and 13 international non-stop destinations in 2017. It is connected to Washington, DC through MARC commuter rail. BWI began a CAD78 million expansion of its international terminal this year, adding six new gates.

Washington Dulles International Airport, 40 kilometers to the south of DC in Virginia, handled over 22 million passengers and 57 international non-stop destinations in 2017. The facility has been expanded several times in the past 10 years and construction of a fifth runway is a prospect. WMATA is building a Metrorail line directly to Dulles, which will connect the airport to the greater Washington Metropolitan Region. This line will be owned and operated by WMATA. The airport is currently connected to DC by an express bus linking the airport to a Metrorail station.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **5.5/10**

In 2005, Washington, DC created a District of Columbia Bicycle Master Plan that proposed a comprehensive network of bicycle lanes and shared-use paths. These recommendations were reaffirmed in the 2014 District of Columbia's Multimodal Long-Range Transportation Plan, which noted that investments in bicycle infrastructure in the previous decade had increased the number of cyclists and made streets safer.

Between 2005 and 2014, DC increased its bike lane network from 30 kilometers to 111 kilometers. In 2016, CityLab found that nearly 17,000 cyclists, about five percent of DC's commuters, regularly rode their bikes to work in Washington. That's nearly triple the mode share it had in 2006, putting it in second place on the list of biking cities in the US.

DDOT updates the district's bike map annually, with the list proposing additional bike lane expansions. Beyond expanding the network of bike lanes, DDOT continues to improve the quality of existing bike-way and bicycle infrastructure.

Since its beginnings, Washington, DC's design has focused on being inherently walkable. However, while some parts of the district are known throughout the world for being great places to walk because of the grid network and tree-lined streets, many of the grand avenues are now major arterial roadways that present challenges to pedestrians. On average, the district has about 650 pedestrian accidents a year and about 15 deaths.

To address these challenges, DDOT developed the District's Pedestrian Master Plan (2009), which identified eight priority pedestrian corridors in the city and made corresponding recommendations.

DC launched the Vision Zero program in 2015 with a goal to end traffic fatalities by 2024. In this plan, DC sets "neighbourhood slow zones". DDOT has also installed speed cameras across the city to curb speeding through large fines.

In 2017, the district began to move to reduce speed limits on some city streets further, with a DDOT proposal to lower the default 25 miles per hour (mph) speed limit to 20 mph, and establish 15 mph zones around schools, parks, senior centers and youth centers.

DDOT used a public-private partnership to operate its bike share system. Smart Bike DC, the first bike-sharing program in North America, was launched in 2008 with 120 bicycles and 10 automated rental locations. In 2010, DDOT moved to a new regional bike sharing program named Capital Bikeshare, owned by DC but with a private operator and supporting mobile application, with 400 bicycles and 49 stations. By 2018, the system had expanded to 4,300 bikes and nearly 500 stations in the Washington metropolitan area.

BUILT FORM: PARKING PROVISIONS

SCORE: **4.0/10**

DC has about 400,000 parking spaces, about 65 percent on-street.

ParkDC is an initiative to manage and regulate the district's curbside and parking assets through meters, permit parking and pay-by-phone services. DC has the largest and most successful implementation of pay-by-phone technology (Parkmobile) in the US. About 40 percent of transactions are conducted by paying through a smart phone. DDOT is testing this program in three high-demand areas, which has been successful to date. In 2013, DDOT engaged residents before creating the 2013 Parking Action Agenda and, recently, DC has begun piloting a performance-based parking program to manage on-street parking.

Given the flood of tourists, DDOT regulates tour bus parking in residential neighbourhoods and around major attractions and Metrorail stations.

The district has standard rush hour parking restrictions on priority transit corridors from 7.00 am to 9:30am and 4:00pm to 6:30pm.

The 2016 revised zoning regulation relaxed restrictions on dwelling units (accessory apartments) not directly attached to homes to incentivize the adaptive reuse of structures such as garages and historic carriage houses.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

A variety of private point-to-point transportation services exist in DC, including taxis, cars for hire and tourist services. However, due to an increase in ride-share services, taxi patronage has fallen by 31 percent.

DC has a plethora of on-demand and ride-share services available throughout the city, giving Zipcar and Uber increasing competition. DDOT has supported the growth of ride-hailing services by piloting a program that removes parking spaces in popular nightlife locations to provide pick-up/drop-off zones for services such as Uber and Lyft.

GetAround and ZipCar provide two very different on-demand, car-sharing models for those who want occasional access to a private vehicle in the District. DDOT has partnered with both traditional and point-to-point car-sharing companies to incentivize car-sharing and establish a low emission and environmentally friendly fleet of cars.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

DC began to explore Connected and Autonomous Vehicles last year by collaborating with city leaders from around the world as part of the Bloomberg Aspen Initiative on Cities and Autonomous Vehicles. The Mayor recently traveled to Silicon Valley to pitch the city as a test area for the technology.

The Interagency AV Working Group was set up February 2018 to help to prepare the city, its residents and infrastructure for autonomous vehicles testing and other developments. This group comprises leaders from city agencies focused on transportation, disability rights, environmental issues and public safety.

DDOT also oversaw a pilot program that introduced Starship Technologies' driverless delivery robots.

DC has established a variety of incentive programs to encourage green driving practices in the district:

- Emission testing exemption for electric vehicles
- Reduced car registration fees
- Alternative fuel vehicle conversion credit of up to CAD25,000
- Alternative fuel infrastructure tax credit for half of electric vehicle supply equipment (charging station), up to CAD1,300
- Public charging-station tax credit for up to CAD13,000.

In 2010, DDOT launched the Park and Charge Pilot to provide electric vehicle users with the ability to charge at public curbside parking spaces. These chargers are part of the ChargePoint America network which allows users to sign up in advance and receive a card that can then activate network chargers nationwide. Today, there are 100 charging locations in the district as part of this program.

Due to the security needs of and heightened threats to myriad federal and important buildings, such as the White House and Capitol, DC has no-fly zones that ban drones because of sensitive, restricted airspace. Washington's Flight Restricted Zone stretches about 24 kilometers from Reagan National Airport and bans drone flights not specifically authorized by the FAA. However, hundreds of drones enter these areas, often inadvertently, presenting a constant security challenge.

Therefore, DC is not a strong candidate to use drones/ unmanned aerial vehicles for transportation, logistics and delivery.

TECHNOLOGY
8.3/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Through its Comprehensive Plan and the Office of the Chief Technology Officer (OCTO), DC has created goals and programs to continually improve its digital infrastructure (wireless networks, fiber optics and broadband telecommunications) citywide. The district sees accessible digital connectivity as important to residents and businesses because it is vital to economic development. The district is a strong example of a city that is providing connectivity and infrastructure with an emphasis on equity by making a considerable effort in providing network availability to its poorest communities.

The district's OCTO is essential to success on this front. The OCTO is responsible for improving, enhancing, securing and expanding wireless technology, communications systems and electronic commerce throughout the city. The OCTO develops and enforces the policies and standards for information technology in the Distric.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Replacing copper wire with fiber optic cable is essential for any city to support both consumers and businesses as society becomes more dependent on the ability to receive and transmit information.

The district provides a fiber optic wireless service called DC-Net to all government constituents across the city over a secure and exclusive telecommunications platform. Despite only half the public having fiber optic service, independent group Akamai Technologies reports that Washington, DC has the highest average connection speeds in the US.

The district also provides the DC Access program, a free local service to the public in some areas of the city. DC Access does not use fiber optic cable but is still considered highly reliable by consumers. The District has created a City of Access initiative that provides free internet access at free or low-cost computer sites for low-income DC residents.

The initiative also aims to expand internet access and technology training in DC neighbourhoods by combining public and private institutional resources.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **8.0/10**

The availability of Wi-Fi is essential for both personal and business applications. Washington is covered with free public Wi-Fi hotspot sites where anyone with Wi-Fi capable devices can browse the internet using the district's own wireless network. The district has also developed a streamlined process for providers to install wireless communications facilities on poles throughout the city. These small cells improve the quality of wireless service with faster data coverage and more capacity.

In 2017, Verizon Wireless and Samsung announced that they had selected DC for early 5G tests, in addition to 10 other markets. Washington was selected as a pilot city because of its varied terrain, neighbourhood layouts and population density. While the next-generation 5G is not expected to be commercially available for several more years, Samsung and Verizon said the customer trials would gauge user experiences, evaluate the performance of 5G technologies and help streamline 5G delivery in various environments.

The district has created several Smart Cities initiatives that span multiple departments and areas of interest but the Internet of Things (IoT) technologies are crucial to these initiatives bearing fruit. Therefore, the city has launched the Pennsylvania Avenue 2040 (PA2040) Project, an initiative to implement IoT technologies along Pennsylvania Ave. This pilot aims to create models for replication and scalability for the rest of the city.

Along with PA2040, the city has also partnered with 20 other US cities to commit to common principles for the responsible and equitable deployment of the IoT. This includes providing a common framework, ensuring openness and transparency regarding the use of public space, and advancing the public dialogue to ensure these technologies are used in a way that maximizes public benefit.

OPEN DATA

SCORE: **9.0/10**

The district makes a concentrated effort to provide open government data through the Chief Data Officer. In support of the district's Open Government Initiatives related to data transparency and accountability, government operational data is made available to the public. Web-based applications developed by OCTO have provided both visualized data and raw data for multiple formats. The Open Data DC Catalog shares hundreds of datasets.

There is also a classification system that allows the public to understand when and why some data is not open to the public, which applies a five-point sale. This allows for transparency even if the data is not publicly released.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

The district is trying to maintain and improve the digital security of the city. Authorities give priority in their Comprehensive Plan to the notion that such security infrastructure is critical in the 21st century, particularly given the security and information needs of the nation's capital. The OCTO has established an Information Security Program and Division (ISP Division) responsible for the citywide information security platform and policies as well as credentials for district employees. DC One Card Program manages the district's credentialing system, used by both employees and residents. Employees and contractors will be granted only the level of access to information and automated systems they need to do their jobs.

The ISP Division says it deploys an effective information security architecture that mitigates the technical vulnerabilities within the DC Wide Area Network serving district agencies, provides a secure network environment for all government buildings and ensures compliance of health information privacy regulations. DC.gov promises that individual identifying information will not be shared, sold or transferred to any third party without prior consent. On its website, the OCTO has listed several cybersecurity recommendations for the general population to follow to prevent a security risk on their own.

There are also programs to use technology throughout the district to improve the physical safety and security of citizens. The Private Security Camera System Incentive Program encourages residents, businesses, non-profits and religious institutions to install security camera systems on their property and register them with the Metropolitan Police Department. To date 9,074 cameras have been funded.

PLANNING AND POLICY

SCORE: **9.0/10**

The District Comprehensive Plan's telecommunications section has an overarching goal to provide high-quality digital infrastructure (wireless networks, fiber optics and broadband telecommunications) to help support economic development, security and education goals

Part of its policy is the accessibility of digital infrastructure. The Connect.DC- Digital Inclusion Initiative provides public computer access and internet access anywhere in the district for people who don't have access to affordable broadband data or own a computer. The plan delegates the responsibility of carrying out the improvement, enhancements, and expansions to the Office of the Chief Technology Officer (OCTO).

URBAN SYSTEMS
6.1/10

POWER GENERATION AND DISTRIBUTION

SCORE: **7.0/10**

DC seeks to modernize the power generation and distribution systems to achieve its climate change goals established within the 2013 Sustainable DC Plan and elaborated further within the Climate Change section.

The Department of Energy and Environment developed the 2016 Clean Energy DC plan to realize these GHG, energy use, and renewable energy targets through a series of strategies, supported by many recommendations, focusing on the role of buildings, the energy supply system and transportation.

While the district does not have a formal goal to secure 100 percent renewable energy by 2050, the Clean Energy DC plan establishes progressive, at present unfunded, recommendations that will be needed for a zero-carbon future.

The plan's renewable supply considerations from outside the district include legal recommendations, such as designing a renewable portfolio standard for 100 percent renewable energy, amending purchase power agreements, and enacting GHG intensity legislation.

Clean Energy DC advances renewable energy supply by providing recommendations to advance regulatory overhaul and strategic planning efforts. Regulatory overhaul focuses on adopting renewable energy generation building code requirements and building performance standards. Planning recommendations include developing a solar proliferation strategy, a centralized solar information and commerce platform, a neighbourhood-scale micro grid energy strategy, and a fossil fuel heating study.

In 2015, the Public Service Commission initiated the regulatory action Formal Case 1130 (FC1130) to modernize the energy delivery system for increased sustainability and will make our system more reliable, efficient, cost-effective and interactive. As such, the 2016 Clean Energy DC plan contains recommendations to develop this program's scope and schedule, and to cultivate the necessary community involvement. However, Pepco, the district's energy supplier, has already completed an advanced metering infrastructure project by exchanging more than 99 percent (>296,000) of traditional meters for smart metering.

WATER TREATMENT AND DISTRIBUTION

SCORE: **5.3/10**

Washington, DC's drinking water originates from the Potomac River. Originally built in 1859 by the US Army Corps of Engineers, the Washington Aqueduct transports the Potomac's Great Falls and Little Falls intakes to the water treatment facilities at the McMillan and Dalecarlia reservoirs. While the Washington Aqueduct originally referred to the physical water conveyance, the Washington Aqueduct technically refers to a federally owned and operated public water supply agency within Baltimore District, U.S. Army Corps of Engineers. As such, the Aqueduct sells water to DC Water, which then manages all aspects of distribution, billing, and customer service within Washington, DC and parts of Maryland's Prince George's and Montgomery counties, as well as parts of Virginia's Fairfax and Loudoun counties.

DC Water collects and treats the district's wastewater at its 60-hectare Blue Plains Advanced Wastewater Treatment Plant in the district's in Southwest Washington, D.C. The plant treats 1.4 billion liters a day with a peak capacity of 4.073 billion liters per day.

The district has set the following drinking water-related performance measure targets:

- Replace and/or rehabilitate at least 1 percent of linear infrastructure annually
- Make 100 percent of district waterways fishable and swimmable
- Use 75 percent of the landscape to capture rainwater for filtration or reuse
- Decrease total water use by 40 percent.

The Chesapeake Bay Total Maximum Daily Load (TMDL) program drives a significant amount of the region's long-term water infrastructure planning. Also known as a "pollution diet," the TMDL program sets limits on phosphorus, nitrogen, and sediment pollution and establishes Federally enforceable two year milestones. Additionally, Municipal Separate Storm Sewer (MS_4) permits require the district to reduce impervious surface area. The District incentivizes reducing impervious surfaces through:

- 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control;
- 2013 Stormwater Management Guidebook to implement the 2013 rule; and
- RiverSmart, a collection of programs that offer financial incentives for residents, non-profits, schools, and communities
- A stormwater utility fee which levies a fee based upon a property's total impervious surface area. This fee partially funds the Clean Rivers Program to reduce combined sewer overflows.

The TMDL program incentivizes proactive watershed planning, especially for Washington D.C.'s two rivers, the Anacostia and the Potomac. While the Potomac River directly supplies the district's drinking water, the district does not have a plan to make the river fishable and swimmable. However, two organizations help protect the Potomac River's drinking water sources and ensure the river meets the TMDL requirements: The Interstate Commission on the Potomac River Basin (ICPRB) and the Potomac River Basin Drinking Water Source Protection Partnership (Partnership). The ICPRB is an advisory, non-regulatory interstate agency created by an interstate and Washington, DC compact and guided by their 2015 Strategic Plan and Work Plan.



The Partnership is a voluntary association of 20 water suppliers and government agencies guided by their 2011 Strategic Plan Update and 2017 Work Plan. See the Public Realm for discussion around the Anacostia River and its water quality goals.

DC Water's Blue Horizon 2020 strategic plan not only emphasizes the need to improve water quality and meet compliance requirements, but also acknowledging the potential for population trends to stress future water availability. However, climate change-driven precipitation increases may simultaneously placate future water availability concerns and dis-incentivize water conservation efforts. Furthermore, the Department of Energy and Environment's Climate Ready DC plan acknowledges the need to consider flood risk with replacing infrastructure.

Blue Horizon 2020 also emphasizes the need to enhance operations through innovation and sustainability. To this end, DC Water has recently completed significant, innovative water investments, including:

- Completed in 2000, the 950 million USD biological nitrogen removal project to allows Blue Plains to surpass TMDL requirements and attain 4 mg/L nitrogen concentrations.
- Completed in 2015, the 470 million USD thermal hydrolysis and anaerobic digester project uses high heat and pressure to cook biosolids and generate methane gas and high-quality compost. The facility captures and uses methane to generate 10 megawatts of electricity, which powers a third of the Blue Plains facility.
- Part of the Clean Rivers Program was recently completed, a CAD3.4 billion, 29-kilometer tunnel coupled with green infrastructure designed to manage 200 hectares of impervious surfaces and eliminate 96 percent of stormwater overflows across the system.

WASTE MANAGEMENT

SCORE: **8.0/10**

In 2014, DC passed the Sustainable Solid Waste Management Amendment Act which aimed to achieve 80 percent landfill diversion and 20 percent waste to energy (WTE) conversion and submit annual reporting. To support these laws, the Sustainable DC plan set targets of reducing total waste generation by 15 percent and reusing 20 percent of all construction and demolition waste.

The Interagency Waste Reduction Working Group represents a coalition of DC agencies to implement the Zero Waste DC program and achieve performance targets. DC agency members and their waste responsibilities include:

- Department of Public Works (DPW): Manages trash, recycling, and household hazardous waste collection programs, including third-party operators. It collects compost from public schools, loose vacuumed leaves, and the farmer's market drop-off program.
- Department of Energy and Environment: Manages hazardous waste generation, training, permitting and remediation. This includes underground storage tanks, the voluntary clean-up program, lead, mold and pesticides.
- Department of General Services (DGS): Construction and maintenance of government buildings.
- Department of Parks and Recreation (DPR): Construction and maintenance of recreation facilities. Manages the DC Community Compost Cooperative.

In the 2016 to 2017 financial years, the district diverted 22.98 percent of all residential waste from landfills. To improve the diversion rate, Washington, DC plans to strengthen its recycling, composting and WTE programs.

Six recycling facilities in Maryland and Virginia process 52,289.49 tons of waste, or 22.1 percent of total waste. DPW manages the district's recycling program, offering recycling collection services from single family homes and apartment buildings with three or fewer living units. Under a 2010 DC law, commercial establishments must maintain an active recycling program, provided through a DPW-permitted waste collection company. Commercial establishments range from apartment buildings, retailers, offices, restaurants, schools, and non-profits, but currently do not include buildings with mixed uses. The 2009 Healthy Schools Act requires DGS to implement a recycling program and other initiatives in DC public schools. Multiple composting facilities produced 5,779 tons of compost, or 2.4 percent of total waste.

DPW composts loose leaves collected through street vacuuming, whereas the DC Public School composts cafeteria waste. DPR also supports the DC Community Compost Cooperative, which includes 50 sites that enable 5,000 residents to compost material from their homes and gardens. Seven landfills in Virginia manage 270,770 tons of trash, or 11.4 percent of total waste.

DPW collects trash from single-family homes and apartment buildings with three or fewer living units, and third-party waste companies collect from larger apartment buildings and commercial properties. Since the district deposits its trash in Virginian landfills, Virginia's Department of Environmental Quality and county governments directly manage those waste facilities and potential reclamation efforts.

A big WTE facility located in Lorton, Virginia incinerates 151,908 tons of waste to create energy, or 64.1 percent of total waste. When considering all received waste, this facility processes 3,000 tons per day to produce 80 megawatts of renewable energy.

The district has passed two notable laws to discourage plastic waste:

- Sustainable DC Omnibus Amendment Act of 2014 immediately prohibited the use of polystyrene food service products and required food service ware to be compostable or recyclable by 2017.
- Anacostia River Clean-Up and Protection Act of 2009 requires businesses to impose a five-cent fee for each paper and plastic bag distributed. Revenues are dedicated to the Anacostia River Clean-Up and Protection Fund.

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10

Toronto is Canada's largest city and one of the most multicultural in the world. It is located on the northwest shore of Lake Ontario, and has evolved into a dynamic city that has an efficient subway, and a waterfront that continues to be developed to maximize the quality of living.

AT A GLANCE

RANKED **10**
CITY SCORE: **27.55**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.9/10	**5.9/10**	**7.7/10**	**6.1/10**

The city is positioning itself as a global hub for urban innovation with the recent announcement of Sidewalk Toronto, a new mixed-use people-centered neighbourhood that combines urban design and digital technology.

Considered a world leader in areas such as business, finance, technology, entertainment and culture, it is Canada's financial and economic hub. It is also a prominent center for television production and home to the country's major broadcast networks.

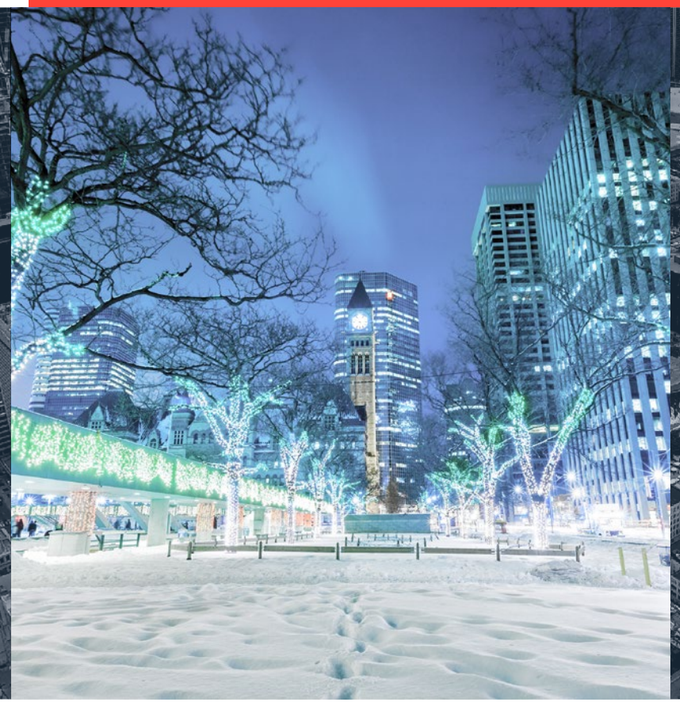
Boasting one of the lowest tax regimes among international cities, Toronto has an important competitive advantage for international organizations. Plus, its location means that it is a major transportation hub with well-developed air, road, rail and maritime links to the rest of the country, the USA and Europe.

A big part of Toronto's charm is reflected through its many cultural neighbourhoods where the old European charm is blended with North American energy. Old Victorian houses, churches of bygone eras and modern skyscrapers coexist to make the city, both productive and inviting. Another striking feature is the wealth of parks and trails, and bicycle paths that stretch for more than 660 kilometers.

Through the construction of new housing and mixed-use projects, restoration and rehabilitation of heritage areas, and investment in a light rail network (the second busiest light rail system in North America), the city's urban core is poised to expand. The emphasis for targeted investment in infrastructure has been placed on local transit, transportation and affordable housing. The objective is to make the city smarter, greener and more inclusive.

Toronto has a bright future of continued multiculturalism and growth. By 2030, first and second generation immigrants are expected to be 78 per cent of the population, up from 50 per cent today. By 2040, up to 110 million passengers will pass through Southern Ontario's airports.

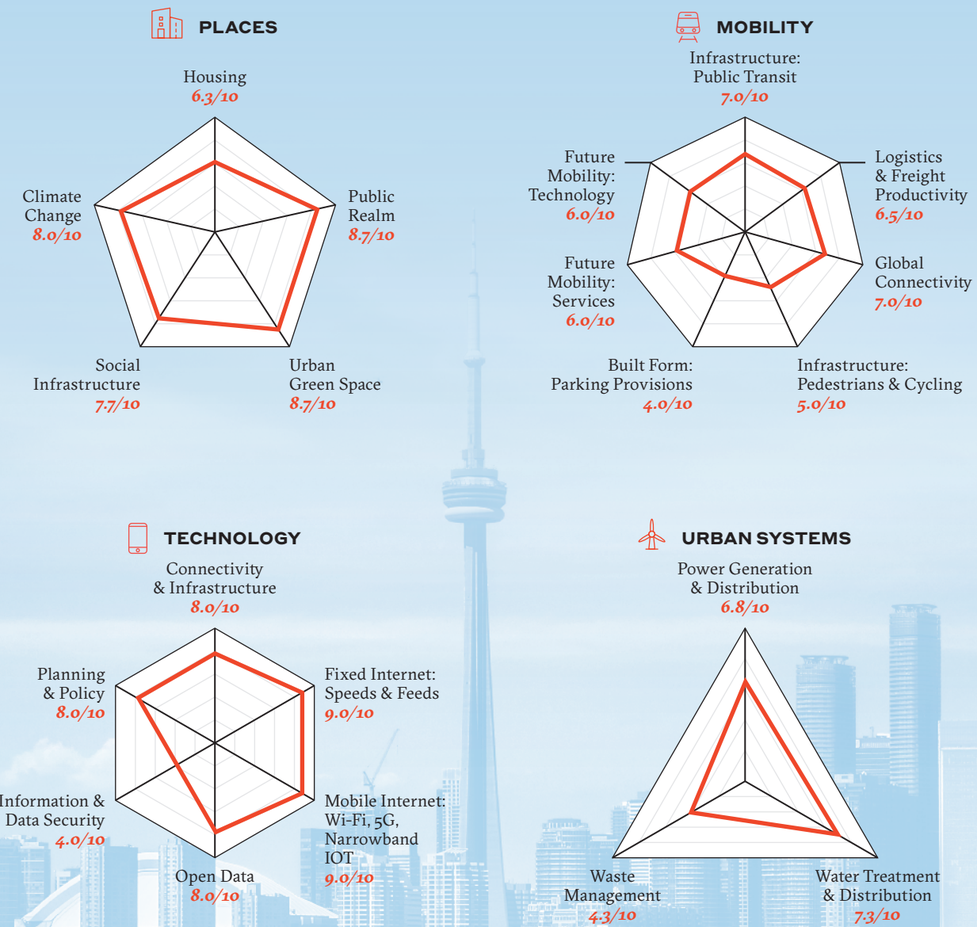






TORONTO

CITY ASSESSMENT



HOUSING

SCORE: **6.3/10**

The Greater Toronto Area (GTA) is the most populous metropolis in Canada with a population of 6.26 million in 2018. It is centered on the City of Toronto and surrounded by several regional municipalities.

In the next 50 years, the population in GTA is expected to continue growing rapidly, as the population density in the City of Toronto soars from 4,150 people per square kilometer in 2016 to more than 7,700 in 2066. Providing affordable housing is likely to be an ongoing challenge.

The City of Toronto's Strategic Plan 2013-2018, which is due for an update, supports the provision of affordable housing because of its role in developing healthy and diverse communities and generating economic development. The Housing Opportunities Toronto Action Plan 2010-2020 was developed to guide the government funding decisions and the actions of the city's housing development partners. Halton, Peel and York have produced strategic housing plans and the Ontario Government has recently updated the Residential Tenancies Act to expand rent control and slow the rising cost of rental housing in the province. Durham, for example, has a housing plan for 2014-2024, that lays out the region's vision for housing and how to deal with homelessness. The Durham Housing Review included extensive research on the supply of housing, affordability, demographic trends and the specialized housing needs of diverse populations.

Rapid population growth across the region has made it difficult for housing supply to keep pace. Although increases in property prices have slowed from a peak, they remain quite high.

PUBLIC REALM

SCORE: **8.7/10**

Several policies and strategies are in place for enhancing the public realm within the GTA. The Growth Plan, a regional management policy for Greater Golden Horseshoe, includes policies for general intensification, new development and designated greenfield areas that focus on transit-supportive urban design, and pedestrian-friendly streets.

It also encourages the design and development of vibrant public spaces and outlines strategies and acts for waterfront planning regeneration initiatives such as the Great Lakes Strategy and the Great Lakes Protection Act 2015.

The policies and framework identified in the Growth Plan have been adopted by all regional municipalities. While high-level goals are established in regional planning documents, strategies and action plans are typically created at the city level.

The City of Toronto tackles streetscape design with policies that are tailored for different land-use designations in its Official Plan. The importance of public space is also reflected in several other manuals and studies. The city has addressed the protection and revitalization of the waterfront in its Port Lands Flood Protection 2016, the Waterfront Strategic Review 2015 and the Central Waterfront Secondary Plan. These documents include a comprehensive flood-proofing strategy, guidelines to revitalize the waterfront and a framework for a myriad of renewal activities. The Peel Region's Official Plan addresses transit-supportive urban structure and encourages municipal governments to prepare policies that guide streetscape design, and ensure pedestrian safety and security. It also includes objectives and policies to preserve the Lake Ontario Waterfront and to encourage waterfront regeneration. The York and Durham's plans also include policies for high-quality urban design that promotes pleasant landscaping, as well as dynamic public spaces and streetscapes.

URBAN GREEN SPACE

SCORE: **8.7/10**

The Greater Golden Horseshoe Growth Plan includes policies that protect parks, natural systems, heritage, and the lands within the green belt, as well as promoting the connection of green spaces. The Growth Plan addresses expanding protected green space and encourages municipalities, non-profit organizations and other stakeholders to be involved.

The City of Toronto's Official Plan supports expanding the urban forest and sustaining biodiversity, and stresses the importance of maintaining urban fauna and flora. It has created guides to provide direction on integrating and expanding green infrastructure and creating context-sensitive green streets, as well as recommendations to enhance the tree canopy within the city. The Official Plans of Peel, York and Durham promote the expansion of the green space network and sustaining existing spaces. All of the regional municipalities include goals and policies to protect existing urban forests and enhance biodiversity.

SOCIAL INFRASTRUCTURE

SCORE: **7.7/10**

Social infrastructure has a key role in creating sustainable communities that maintain and improve the standard of living and quality of life. The authorities within the GTA are aware of such need and have developed policies and plans to address and invest in assets for education, healthcare, childcare and public institutions.

The primary/secondary school boards in the GTA have needs-based forward planning to accommodate the changing demographics, which directly affects the funding allocation. The Ontario Ministry of Education has an accommodation review process that guides Ontario's school boards through consolidation and closing of schools according to needs, but decisions often get intertwined with local politics.

To support the substantial growth of the post-secondary education system, the Government of Ontario has developed a Major Capacity Expansion Policy Framework to plan to address education capacity needs, which is in line with the provincial growth planning priorities and expected changes to enrolment. The government also supports expansion through releasing a request for proposals in 2014, for post-secondary institutions to apply for funding. As a result, several post-secondary institutions have received funding for new campus construction.

Last year, York University received CAD127 million and this year CAD90 million was approved, for Wilfrid Laurier University in Halton and a joint Ryerson University and Sheridan College campus site in The Peel Region.

The GTA's needs for healthcare are identified in Patients First: Ontario's Action Plan which was launched by the Ministry of Health and Long-Term Care, and includes the need for more doctors and nurses in Ontario's hospitals, clinics, and healthcare centers. The government has allocated support and funding for more than 50 hospital projects across the province to allow better access to service with shorter waiting times.

Funding has been made available for present and future renovation and construction of primary healthcare centers across Toronto. From 2015-2016, close to CAD1.4 billion was invested in expanding, renewing and modernizing hospitals.

Overall, the province is expected to increase healthcare, both acute and primary, investments by CAD11.5 billion during the next three years. Examples of projects include the redevelopment of Markham Stouffville Hospital, construction of the New Vaughn Mackenzie Health Hospital, procurement/planning of Michael Garron Hospital (a new patient care tower in Toronto), the redevelopment project for Trillium Health Partners in Mississauga and the redevelopment project for Hamilton Health Services.

Patients First: Ontario's Action Plan focuses on preventing illness and disease through education and preventative care, and educating patients so they can make informed decisions about their healthcare options. Other initiatives in primary care include offering free prescription medications for Ontarians under 24, offering more publicly funded vaccines, and increasing the number of nurse practitioner-led clinics. It addressed Ontario's aging population by increasing accessibility to long-term care through community and home care, including CAD100 million over three years to help people living with dementia as well as their caregivers. The Government of Ontario has also placed emphasis on increasing access to specialists and reducing waiting times in primary care to the tune of CAD1.3 billion.

Ontario has developed a five-year strategic approach to childcare that includes a performance measurement strategy to ensure the system is accountable to children and families while providing good value, data management to support decision making, and a research plan to aid improvements to the system. The expansion plan aims to increase access to early years and childcare programs while making the services more affordable. Last year, the ministry provided CAD1.37 billion to 47 municipalities, including Toronto, to enhance wages of childcare providers and expand the number of childcare spaces. This funding helped increase the number of spaces by 24,000, working toward the government's goal of providing 100,000 more children under four with access to childcare in the next five years.

While grants and funding are available for Toronto's cultural assets, there are very few disclosed or comprehensive plans for new or expanded cultural assets — the funding largely covers operating costs, project costs and event marketing costs. There is evidence of funding for the expansion of some institutions, such as the government fund of CAD5 million for the expansion of the Museum of Contemporary Art Toronto. The Toronto Public Library also has plans to renovate four libraries across the district and to reconstruct and expand the St Clair/Silverthorn branch library.

Operational funding is available to support libraries in Ontario, such as CAD3 million for improving digital services and CAD10 million for public library research and innovation projects. Similarly, there are several grants that provide operational support for cultural attractions such as museums, galleries and community centers.

CLIMATE CHANGE

SCORE: **8.0/10**

Canada is a world leader in the fight against climate change, and the regional municipalities in the GTA are acting to reduce emissions and spark innovation. The City of Toronto has committed to an ambitious set of citywide energy and greenhouse gas (GHG) reduction targets, including a goal of reducing GHG emissions by 80 per cent of 1990 levels by 2050, and a pledge to increase renewable and district energy generation.

The Zero Emissions Buildings Framework comprises a full set of targets for the five most common building archetypes that require increasing levels of performance over time, updated Energy Modelling Guidelines and a Climate Change Resilience Checklist for New Development. All new private and public developments must meet the Toronto Green Standard, which consists of stepped levels of performance measures with supporting guidelines that promote sustainable site and building design.

Toronto's new and ambitious climate action strategy, TransformTO, also helps by targeting a reduction in local GHG emissions. As a member of the 100 Resilient Cities Network (100RC), Toronto is working to improve resilience to the physical, social, and economic challenges, including climate change, inequality, aging infrastructure, housing and transit. The City of Toronto is receiving funding and resources to hire a Chief Resilience Officer to develop and implement a comprehensive resilience strategy.

Durham has developed a Durham Community Climate Adaptation Plan to prepare for extreme weather through identifying the local risks and consequences and developing solutions. The region is considering programs that will allow it to reach its long-term GHG emissions reduction target while making Durham an even better place to live, work and play. Peel, Halton and York all have strategies to respond to climate change on a regional level.

MOBILITY
5.9/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **7.0/10**

The City of Toronto is the largest city in Canada and the fourth largest in North America. The city's transport forms the hub of the road, rail and air network in the GTA. Travel demand continues to rise as the population increases and the economy grows. As a result, the city has made several efforts to refine its transportation system.

Toronto's mass transit comprises a system of subway, buses and streetcars that are operated by the Toronto Transit Commission (TTC) and inter-regional commuter rail and bus service operated by GO Transit.

Metrolinx, an agency of the Government of Ontario, was created in 2006 to improve the coordination and integration of all modes of transport in the Greater Toronto and Hamilton Area. The first Regional Transportation Plan was developed in 2008 to outline a series of major transportation projects and initiatives that have significant effects. The projects that resulted, not all of them completed yet, include Eglinton Crosstown Light Rail Transit (LRT), Finch West LRT, Toronto-York Spadina Subway Extension, Highway 407 Bus Terminal and the PRESTO fare system integration. Building on the success of the first plan, Metrolinx has updated and published a vision for Toronto's transportation system for the next 25 years.

The City of Toronto houses Union Station, Canada's busiest passenger transportation facility and a National Historic Site. Every day more than 240,000 users pass through it, adding up to more than 65 million a year. It is a major railway station and intermodal transportation hub in Toronto that connects GO Transit commuter rail services and bus terminal, TTC subway and streetcar system, ViaRail and Maple Leaf Train, as well as the Union-Pearson Express (UP Express). The UP Express is an airport rail link that began operating in 2015, connecting the station and the airport in 25 minutes. At present, the City of Toronto is revitalizing the station.

The Government of Ontario, GO Transit, and nine transit systems in the GTHA, including the City of Toronto, and Ottawa have partnered to introduce PRESTO — an electronic fare card that allows riders to transfer seamlessly across multiple transit systems.

By the end of this year, PRESTO fare gates will be installed at all stations. New pass products, such as monthly passes, will be introduced on PRESTO, and more options to buy, load and set a senior/youth fare type will also become available.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.5/10**

The health of the GTA's economy is highly dependent on its ability to accommodate the movement and delivery of goods. Substantial progress has been made in the goods movement planning and policy context in recent years.

Peel Region is an important freight hub for Canada and a strategic location for national distribution. As a key element of the regional economy, Peel has developed a Goods Movement Strategic Plan 2017-2021 to identify initiatives based on present needs and a long-term vision for the goods movement system. Halton, York and Durham have all proposed a strategic goods movement network to accommodate commercial vehicles on a year-round basis. The City of Toronto is committed to supporting the development of a robust goods movement sector through its Official Plan. A framework was developed last year to outline the city's Freight Transportation Plan, which will include a cohesive policy direction and program of actions with specific initiatives.

As the primary international gateway for goods movement, Toronto Pearson International Airport has also developed its masterplan to identify infrastructure needed to accommodate growth until 2037.

GLOBAL CONNECTIVITY

SCORE: **7.0/10**

The Toronto Pearson International Airport is the biggest airport in Canada and second largest international passenger airport in North America. It is the hub for the movement of people and goods across the country and around the globe. Its operator, the Greater Toronto Airports Authority, has developed a Master plan 2017- 2037 for the Toronto Pearson, which will be updated in 10 years. The plan assesses the capacity of existing systems, forecasts the demand for 2037 and outlines the facility improvements that are needed to ensure the airport can meet demand and operate efficiently.

Billy Bishop Airport, near downtown Toronto, offers services to more than 20 cities in Canada and the USA, with connection opportunities to more than 80 international destinations via airlines' networks. It is a key driver of Toronto's economy, accounting for more than CAD2.1 billion in economic output each year.

The Port of Toronto, one of Canada's largest major inland ports, is located on the northwest shore of Lake Ontario, downtown Toronto. It provides access to 25 per cent of Canada's population and serves primarily as a bulk cargo destination. It also has a positive impact on the environment and traffic congestion, taking about 54,000 40-ton trucks off Toronto's roads and highways in 2017. At present, there are no plans for any port infrastructure expansion.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **5.0/10**

The increased use of active transportation typically results in more livable and vibrant cities, which is why regional municipalities within Greater Toronto have invested in improving and expanding its active transportation network in the past decade. The City of Toronto has developed a Cycling Network 10 Year Plan to connect, expand and renew infrastructure for cycling routes through to 2025. The plan serves as a comprehensive roadmap for the city's planned cycling investments, including about 525 kilometers of new infrastructure. By next year a bicycle parking strategy should be ready to be implemented. Halton has completed an Active Transportation Master plan Study to develop the required strategy, infrastructure, initiatives and programs to promote non-motorized travel throughout the region at least to 2031. Durham, Peel and York municipalities have also developed related documents on active transportation infrastructure.

Pedestrian and cyclist safety has been increasing over time with the total collision injuries and fatalities per million trips having decreased since 2003. However, safety is still a major concern for active modes of transport and cyclists and pedestrians still experience high levels of fatalities and injuries with motor vehicle collisions occurring most frequently on roadways in the urban core. Toronto is attempting to address these high injury and fatality rates with the five-year Vision Zero Road Safety Plan.

BUILT FORM: PARKING PROVISIONS

SCORE: **4.0/10**

Overall, parking supply in the region remains abundant and has had negligible effect on managing reliance on private cars.

Parking in the Toronto area is also tied strongly to commuter transit ridership. The TTC has parking facilities in its outlying stations to accommodate riders outside the immediate access area of its metro system. The regional bus and rail system, GO Transit, is known to be one of the largest parking providers in the region, providing major parking facilities at most of its stations for commuters to park-and-ride. Bridging the first and last kilometer/mile of transit trips in the region remains a challenge for Toronto area transit agencies. Parking reduction at transit stations is always contentious, as it may have the effect of shifting first and last mile trips away from private cars, but also cause train operators to lose out on ridership.

The City of Toronto regulates the development of parking space through a zoning bylaw and has regulations for parking (cars, buses, delivery vehicles and tour buses) also in place. City-operated parking, Green P off-street and on-street metered charges rates that differ based on the area of the city and on time of day and day of week. Parking prices tend to be competitive with private parking providers.

The city has also developed a guideline for setting up parklets on city roads. A parklet is a sidewalk extension that provides more space for pedestrian by using on-street parking spaces. Once the platform is installed, benches, furniture, landscaping and bike parking can be placed on top, providing additional outdoor amenity area. Parklets can be commonly seen in downtown Toronto.

FUTURE MOBILITY: SERVICES

SCORE: **6.0/10**

The City of Toronto has updated its vehicle-for-hire bylaw after a report prepared by staff in 2016 made a series of recommendations, including fares, accessibility, number of vehicles for hire, taxicab licensing, vehicles, drivers and insurance. The report focused on proposed changes on taxicabs and limousines regulations, and new regulations for Private Transportation Company (PTC) licensing.

Car sharing is also a growing mobility service industry in the GTA, mainly within the City of Toronto, with more than 200,000 residents being members of a car share company. The city has implemented a new car share pilot project and interim policy to enable free-floating, car sharing vehicles to park in residential-permit parking areas of the city. On the other hand, York Region has developed an On-Demand Transit Strategy that seeks to guide future service delivery to low-demand areas and improve transit service efficiency.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **6.0/10**

Ontario was the first province in Canada to allow on-road testing of autonomous vehicles. The Ministry of Transportation of Ontario is running a 10-year test pilot program that allows approved companies and research groups to test their vehicles under certain restrictions, including having a driver in the car to constantly monitor vehicle operation. A year ago, seven groups were approved for on-road testing under the pilot program: Uber, the University of Waterloo, the Erwin Hymer Group, QNX, Continental, X-matik Inc and Magna. However, due to a fatal pedestrian crash involving their autonomous vehicle in Arizona on 18 March 2018, Uber has suspended all its self-driving testing, including operations in Toronto.

At present the City of Toronto's Transportation Services Division is implementing its three-year Automated Vehicles Work Plan. This plan helps the city's various divisions to prepare for automated vehicles and the changes that may arise with the deployment of these vehicles in Toronto. The technology of autonomous or driverless vehicles is also mentioned by the regional municipalities as a challenge.

As highlighted in the TransformTO report, electrification of transportation is part of how Toronto will achieve a reduction in vehicle emissions. To support the transition to electric vehicles (EV), the city is developing strategies that include EV charging infrastructure and any implications EV use might have for the electricity grid. Provision of EV supply equipment in all new multiresident buildings has also become mandatory.

The use of unmanned aerial vehicles or drones is another area that has caught the council's attention. In May 2018, it requested a report on a strategy to govern the use of drones in Toronto's outdoor spaces. The strategy will address matters such as public safety and possible restrictions on drone-based photography at parks and other outdoor recreational facilities.

TECHNOLOGY
7.7/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Because of the exclusive federal jurisdiction over wired and wireless telecommunications in Canada, the City of Toronto and regional municipalities have a limited influence on outcomes. A Toronto Broadband Study of Wi-Fi, wireless and broadband found that Rogers Cable and Bell Canada have been the primary providers of wired broadband to Toronto households since the 1990s and standard internet speeds can be bought in most of, if not all, Toronto. The study says price remains a big barrier and that a digital divide exists between residents with and without access to the internet.

The City of Toronto has recognized this problem and is currently working towards resolving the issue. City staff have compiled a report with two primary connectivity objectives: to allow all Toronto businesses and residents to have access to affordable high-speed internet, and to ensure its infrastructure is evolving to align with improved technology standards. Elsewhere in the GTA, municipalities in the York Region have formed a Broadband Advisory Taskforce, and Peel Region has developed a strategy that defines a shared digital mandate and strategic roadmap to meet the growing needs of its residents, employees and partners.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **9.0/10**

Modern telecommunications services are fundamental to Canada's future economic prosperity, global competitiveness, social development and democratic discourse. Fixed and mobile wireless broadband internet access services are catalysts for innovation and underpin a vibrant, creative, interactive world that connects Canadians across vast distances and to the rest of the world.

The big three — Rogers, Bell and TELUS — as well as Shaw, Videotron, SaskTel, Freedom Mobile and Cogeco, have mature networks on fiber and/or mobile, and are continuing to invest heavily in infrastructure developments. One of the primary providers in Toronto has deployed a full fiber optic internet network that provides symmetrical download and upload speeds up to 1 Gigabit per second.

This provider also says that the gigabit Fiber-to-the-Premises (FTTP) network will provide customers with the ability to download a three-gigabyte high-definition movie in 24 seconds or upload a 500 megabyte file to the cloud in four seconds. The network consists of more than 10,000 kilometers of new fiber on about 90,000 hydro poles and underground via more than 10,000 manhole access points, serving 3.7 million locations with FTTP connections, and expects that to grow to 4.5 million by the end of this year.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

The Canadian Radio-television and Telecommunications Commission (CRTC) regulates the fiber and wireless companies to ensure access to the services. A 4G/Long Term Evolution (LTE) service has been launched by network providers in Toronto using compatible wireless devices. These primary providers all have plans for deploying 5G tests within the city. The speed, reliability and scalability of 5G will be able to support a connection between physical devices to make the communication of the Internet of Things (IoT) a reality. This outcome then might be beneficial to connected and autonomous vehicles communications.

Industry Canada, now known as ISED (Innovation, Science and Economic Development), is preparing for spectrum auctions to support 5G and other mobile evolutions. The governments of Canada, Ontario and Québec have partnered with some of the world's digital heavyweights to work towards the next generation of wireless technology. A new project, ENCQOR, will create a 5G wireless corridor through the two largest provinces in Canada, to support the growing network of physical devices, vehicles and other objects that are increasingly communicating directly with each other. This project will allow an estimated 1,000 small- and medium-sized businesses to plug into an early 5G platform for research and development.

OPEN DATA

SCORE: **8.0/10**

Last year the City of Toronto developed an Open Data Standard that has opened an online catalog for the public. As of 14 May 2018, the city had made 1,236 data files available in a variety of useable formats and free of charge. The Government of Ontario also has an open data catalog with both open and restricted data sets.

INFORMATION AND DATA SECURITY

SCORE: **4.0/10**

The Province of Ontario has legislated to protect personal privacy. The two acts are based on the principles that an individual has the right to control his or her personal information, and that privacy rules governing the collection, use, disclosure, retention and disposal of personal information are necessary.

Canada also has enacted the Privacy Act to govern the use of all personal information collected by the Federal Government and the rights Canadian citizens have to access information that has been collected. As well, the Federal Government has enacted the Personal Information Protection and Electronic Documents Act to, "Govern the collection, use and disclosure of personal information in a manner that recognizes the right of privacy of individuals with respect to their personal information and the need of organizations to collect, use or disclose personal information for purposes that a reasonable person would consider appropriate in the circumstances."

The City of Toronto website has a commitment to protect the privacy of any personal information users may provide when visiting their website.

PLANNING AND POLICY

SCORE: **8.0/10**

The planning and policies for facilitating or commissioning communications infrastructure are regulated on a federal level. The CRTC is the organization that regulates and supervises broadcasting and telecommunications in the public interest across Canada. The CRTC Three-Year Plan outlines key activities until 2020. Due to the exclusive federal jurisdiction in Canada, the City of Toronto has a limited role in influencing planning and policies.

URBAN SYSTEMS
6.1/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.8/10**

The City of Toronto has committed to an ambitious set of citywide energy and GHG reduction targets, including a goal of reducing GHG emissions by 80 per cent of 1990 levels by 2050. To reduce the demands placed on provincial power generation infrastructure and reduce emissions, the city has also pledged to increase renewable and district energy generation. A Design Guideline for District Energy-Ready Buildings has been compiled for building developers and owners, architects and engineers. The city has identified almost 30 locations with the potential to support new district energy systems (usually hot water, steam or chilled water piped from a central plant).

There are several smart grid/city/metering initiatives being spearheaded by the private sector, but not the City of Toronto. However, the city does have a district energy initiative that will ultimately rely on smart controls.

While there is no financial investment policy framework for emerging energy generation technology, the City of Toronto does support renewable energy generation indirectly through the Zero Emissions Buildings Framework, Toronto Green Standard, and Green Roof Bylaw (which rewards solar PV in place of vegetation).

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.3/10**

The major challenges for water infrastructure and management that the GTA will face are the tremendous population growth and urban development growth.

The City of Toronto has continued to plan for growth and aligns its financial plan with the required infrastructure improvement and maintenance to ensure it meets its water quality standards. It also promotes the reuse of stormwater to reduce storm runoff from urban areas and decrease the demand on the potable water system.

A 20-year Energy Optimization Plan was developed to help Toronto Water, its biggest energy user, implement capital projects and make operational changes to improve energy efficiency and still provide quality water services. The city's Wet Weather Flow Master plan is a long-term strategy plan that focuses on protecting the environment and water quality in Lake Ontario, rivers, streams and other water bodies from all stormwater (rain and snow melt).

WASTE MANAGEMENT

SCORE: **4.3/10**

Waste management plays a vital role in the cleanliness and sustainability of the GTA. The City of Toronto has developed a Long-Term Waste Strategy to identify the action needed to best manage the city's waste in the next 30 to 50 years. The strategy focuses on waste reduction, reuse, recycling, recovery and residual disposal policies and programs that are environmentally sustainable, socially acceptable and cost-effective. The city has also implemented many reduction and reuse programs such as the Sharing Library, which allows the public to borrow materials (tools and bikes, for example) and Support for Reuse Events that allow residents to trade or swap materials in a convenient, yet structured way.

York Region has developed SM4RT Living Plan (Integrated Waste Management Master plan) which identifies more than 60 initiatives that set the stage for waste management in the region during the next 25 to 40 years. Durham Region tracks and reports its waste management activities, and has recently developed an Organic Management Strategy that plays a role in capturing and diverting organic materials. It provides residents with a network of drop-off facilities for waste electronics, and offers programs for call-in curbside collection and reuse drop-off. Peel Region and Halton Region have also developed their own waste management-related documents to continue their efforts in waste diversion.



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11

LONDON



The most populous city in the country, London is the capital of England and the United Kingdom (UK). The city is steeped in history as it has been a major settlement for 2,000 years. London is a leading global hub and home to one of the world's largest financial centers, as well as one of the world's largest city airport systems. The city is also a cultural center of global renown.

The Greater London Authority (GLA) is the regional government of the area known as Greater London. The GLA consists of the Mayor of London as head of the executive and the elected 25-member London Assembly, responsible for scrutiny. The GLA shares local government powers with the City of London Corporation and the councils of 32 London boroughs, and was originally set up with the aim to improve coordination between boroughs.

The Mayor proposes policy and oversees a budget of around CAD28.6 billion, supporting investment in public transport, fire services and policing as well as the work of City Hall. The London Assembly is consulted on, and can amend, the Mayor's draft budget. The Mayor acts as chair of Transport for London (TfL), which implements the Mayor's transport strategy and oversees London's transport services. The Mayor sets TfL's budget, appoints the board and is responsible for ensuring London's transport meets its demands. The London Assembly holds TfL to account and reviews and tests the Mayor's transport strategy.

Forecasts indicate that London's population will swell to more than 10 million in 2035, which will place increasing pressure on housing, social infrastructure (particularly education), transport and urban systems.

Sea levels affecting London are expected to rise by 11.4 to 16 centimeters by 2030 and by 14.8 to 20.8 centimeters by 2040. The city is particularly vulnerable to changes in sea level because of the tidal nature of the River Thames, which runs through London's center. It is important that current flood defenses, including the Thames Barrier, which is already nearing the end of the lifespan of its designed standard of flood protection, can withstand this change.

Extreme summer temperatures are expected to increase by as much as 4.5 degrees Celsius and there will be changes in annual precipitation. These changes need to be carefully considered in the city's climate change strategy and for future developments.

Although London has plans and strategies in place to meet future megatrends, including the provision of housing, public transport, urban systems and climate change adaption, it is to be determined the extent to which these plans are sufficient, and achievable.

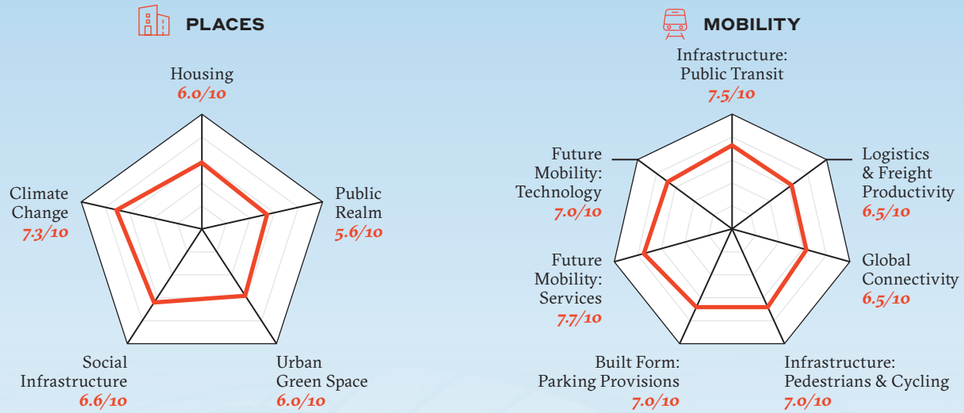
UK cities are required to publish forward plans for relatively short periods, such as five to ten years ahead. While they may be well advanced in forming strategies for the longer timescales under consideration here, such plans are typically not published and so longer-term funding will not be formally earmarked at this stage. Consequently, some of our assessment considers the direction of travel, rather than definitive or funded plans, as the measure of the city's preparedness for the future world of twenty plus years' time.

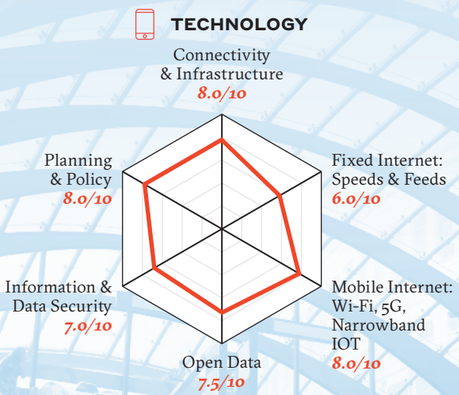
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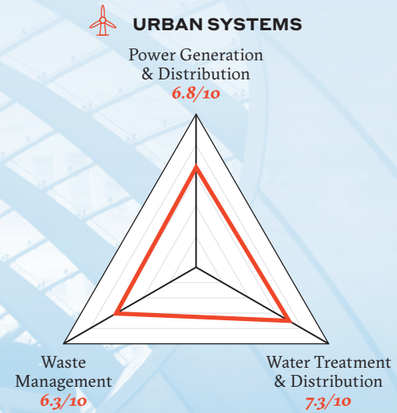
RANKED **09**
CITY SCORE **27.51**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.3/10	**7.0/10**	**7.4/10**	**6.8/10**

CITY ASSESSMENT







PLACES
6.3/10

HOUSING

SCORE: **6.0/10**

Myriad challenges exist for housing development and home ownership in London. Prices are notoriously high, powering ahead year after year as residential construction has continually failed to meet demand. The average house price in London now stands at about CAD807,000. A lack of both private and social housing has led to an affordability crisis, a precursor of other social issues. This trend is also contributing to the expansion of the private rental sector as people increasingly cannot afford home ownership and are often obliged to live outside London and commute to work. This places significant pressure on London's radial transport corridors, which have become overcrowded.

London's planning landscape is well-advanced, and in recent years has focused on housing growth, including high-density development around transport nodes. With density previously measured using Public Transport Accessibility, more recent policy changes are proposing to link density to design, with a presumption in favor of development close to transport links.

The New London Plan (drafted in December 2017) recognizes the likely population growth to 2041 and includes a strategic housing target of 65,000 homes a year by then (increased from 49,000 in the adopted London Plan). The plan also includes a target for half of all new homes to be genuinely affordable. However, there is a mechanism in place to allow for a minimum of 35 per cent, as highlighted in the Supplementary Planning Guidance on Affordable Housing and Viability. To encourage the development of affordable housing, the Mayor has recently pledged funding to help London boroughs build 10,000 council homes by 2022.

In recent years, the average rate of construction was about 30,000 homes a year of which only about 20 per cent were affordable, calling into question the achievability of the new, more than doubled, target. Land for development is in short supply and it is thought that there is insufficient capacity to build the number of homes required without interventions to allow, for example, the release of green belt land or building to higher densities.

Much of London's housing growth is found within Opportunity Areas and Growth Corridors for longer-term delivery. At present about 40 such areas exist across London, the largest being Old Oak Common. The scale of change required the setting up of a Mayoral Development Corporation (MDC) to manage the land assembly, policy and planning process. London may see more of these MDCs being set up to speed up delivery and secure funding because most of these areas need a big investment in transport. New funding mechanisms are being sought that go beyond developer contributions and community infrastructure levies, such as the Mayor's Crossrail Supplementary Planning Guidance, which has been used to fund Crossrail. It might be used to fund other transport improvements in the future.

In recent years, there have been pressures to release employment or industrial land for housing. The draft London Plan seeks no net loss because of the effect on the economy, meaning that housing and employment needs are in direct competition with a new challenge to collocate and intensify different uses in new development. This is both a design and viability challenge. The focus on protection of employment has been an ongoing issue for local authorities in outer London and outside of London. Councils do not want their localities to become dormitory and often lifeless commuter towns; they want to see jobs and housing provided in mixed-use communities.

For housing needs to be met, development will need to be high-density and mixed-use. If such changes in design and housing standards cannot be achieved, the pressure will undoubtedly grow to release the city's green belt, a position that is not politically supported now, although green belt release is more common in local authority areas outside of London. Equally, tensions are likely to grow between inner and outer areas when pressure on housing becomes greater in outer London and character and heritage, as well as green space, are under threat.

The draft New London Plan includes quality and standards for indoor and outdoor amenities, dual aspect dwellings and design layout. Smaller dwellings and a different type of rental sector are envisaged as developers look to new models and methods of house building. This has implications for the transient behavior of people now owning their own homes and being potentially more upwardly mobile. The future of housing in London may become more like in continental Europe, where owning a home is less prevalent, and the government owns a greater proportion of social housing.

This notion gives weight to the idea that the GLA, Transport for London and other public bodies should play a greater role in providing land and delivering housing for a growing population.

The draft plan will officially become London's strategy in 2019 to 2020. Whether the strategy is sufficient to cover the rapid increase in population growth that London is predicted to experience remains to be seen.

PUBLIC REALM

SCORE: **5.6/10**

The London Plan and the Mayor's Transport Strategy (MTS) are geared towards encouraging more walking and cycling in preference to more mechanized modes, pushing health and wellbeing up the agenda. London has planning controls that govern the quality of streetscape developments in its published Healthy Street Checklist document – a good guidance document. Open spaces strategies and investment are the responsibility of each individual borough, but there does not appear to be an overarching strategy for the city. Therefore, it is unclear if sufficient controls are in place to guarantee the amount and quality of urban space to meet the needs of a growing population, which is at the same time placing pressure on land availability. Some housing developments are planned in the waterfront areas of the city but many of them are private, and the public realm strategies for these areas are not as established. There have previously been large investments in waterfront areas of the city, such as the Kings Cross Canal area and the Docklands.

Measures in the London Plan and the MTS set a roadmap for imposing more stringent conditions on parking, reducing non-essential private car trips, encouraging more sustainable travel and reducing freight, all of which will help reduce congestion and air pollution. London's Ultra Low Emission Zones (ULEZs) are amongst the first in the world, imposing tolls on access by more polluting vehicles in the city's drive to improve air quality. The City of London has recently been leading on imposing tighter requirements on freight traffic, and more localized measures, such as access restrictions to specific areas, are being implemented by other London boroughs.

Low car and zero car developments are being achieved through restrictions on parking provision imposed through planning consents. The recently refreshed London Plan imposes stricter requirements on the numbers of electric vehicle charging points that new developments must provide, to enable and encourage the use of electric vehicles, and therefore to improve air quality.

URBAN GREEN SPACE

SCORE: **6.0/10**

London has many fine open spaces. They are typically multifunctional, for ecosystem services and amenity value for residents. Overall, it has been calculated that about 39 per cent of Greater London is open space (18 per cent is designated as such) and 47 per cent is green space, a big part of which is private gardens.

In June 2018, the Mayor of London published his long-term, high-level green strategy for London, with a goal for half of London to be greened, mirroring the draft New London Plan and partly supported by the CAD15.7 million Greener City Fund for strategically important green infrastructure projects. It plans to analyze London's green spaces with a natural capital calculator and implement a greenness index to target investment.

The draft New London Plan (2017) contains a specific green space strategy in a chapter focused on Green Infrastructure and Natural Environment, which aims to protect and enhance green spaces. The strategy also provides an Urban Greening Factor calculation and there is a commitment to fund this development, although there is a funding gap.

The draft plan also discusses national sites such as nature reserves, only discussing their protection but not plans for expansion.

London's sustainable drainage systems strategy is a guide indicating how surface water flooding can be minimized, and will become particularly important with climate change. However, this strategy is a future guide and does not consider alterations to current infrastructure.

SOCIAL INFRASTRUCTURE

SCORE: **6.6/10**

The draft New London Plan deals with the need for education and childcare facilities and says that boroughs should identify local needs and future sites. Boroughs are encouraged to work together and include possible school sites in Development Plans because education needs will increase by up to 67,000 primary school places and by up to 122,000 secondary school places by 2025. Future developments and extensions to university infrastructure, such as student accommodation, are also discussed in the plan, with the Mayor establishing a forum for the institutions to work with boroughs and stakeholders.

An additional 71,000 childcare places are needed between 2016 and 2041, the plan estimates. Their provision is a duty of the local authorities, although information at this level is limited and implementation plans are not evident.

For healthcare, the New London Plan states that boroughs should work with Clinical Commissioning Groups and other National Health Service and community organizations to address local needs and identify sites for future provision. Five subregional Sustainability and Transformation Plans set out the proposed changes to hospital estates and primary care facilities by 2020 to 2021. These five year plans are renewed on expiry.

To expand cultural assets, the New London Plan aims to diversify the range of night-time activities through extending opening hours of galleries, museums and libraries.

CLIMATE CHANGE

SCORE: **7.3/10**

The Mayor's climate change adaptation strategy, Managing Risks and Increasing Resilience (2011), identifies the risks London faces as changes to both average and extreme weather occur.

London's old housing stock and critical infrastructure are already under systemic stress, so investment in retrofitting and adaptation will be crucial. The Managing Risks and Increasing Resilience document has focused on strategies that look to both mitigate and adapt. The document's main adaptation focuses on:

- Helping to reduce flood risk in London
- Helping the city to cope with droughts through a water supply program
- Supporting more green roofs and walls and local green spaces to combat overheating, flooding and drought.

It also discusses how the Mayor will work with London's business-to-business organizations and Business Improvement Districts to help firms respond to the risks and opportunities presented by climate change and extreme weather.

There are, of course, significant costs tied to implementation of the proposed adaptation schemes and strategies and, although a large slice of funding has already been redistributed to London boroughs to implement this strategy, much more is likely to be necessary. There have been some views expressed that the approach so far relies too much on emergency preparedness rather than ensuring long-term resilience of the capital.

As above, the GLA has recently been looking at how to address the negative effects of the Urban Heat Island (UHI), where the city is significantly warmer than the surrounding countryside, particularly in the evenings. Whilst this is generally not a problem in a temperate climate during the summer, overheating in homes, particularly flats, is increasingly becoming an issue (most homes in London do not have cooling).

Delivering London's Energy Future Strategy also looks to reduce the capital's reliability on carbon-intensive energy sources, and sets a target to reduce London's CO_2 emissions by 60 per cent of 1990 levels by 2025. Measures include retrofitting homes and public spaces with better energy efficiency initiatives particularly through the London Green Fund (CAD870 million investment to date). The London Energy Efficiency Fund has also invested CAD190 million in innovative low-carbon projects across London.

The Thames Barrier and its associated estuary flood defense embankments protect London from flooding, including from high sea levels, caused by storm surges in the North Sea. It is now close to the end of its design life in terms of the levels of protection it provides, as sea levels rise and the southeast of England continues to sink gradually.

MOBILITY
7.0/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **7.5/10**

London's Strategic Road Network, the extensive London Underground metro system and the bus networks are managed by Transport for London, while the city's other roads are managed by its boroughs. In 2016, the Mayor of London launched a weekend night tube service; a 24-hour service now runs on five tube lines on Fridays and Saturdays.

Key strategies for transport infrastructure in London include the Mayor's Transport Strategy and The London Plan, which outline the future transport proposals for London. Although these strategies acknowledge the need for increased capacity and include plans to improve capacity on buses, trains and tubes, it is not clear if this will be sufficient to meet the expected future demand (an extra five million trips a day).

Planning permission for new development might be dependent on public transport planning and provision. London's aim of 80 per cent of all trips being made by walking, cycling or public transport by 2041 can only be achieved through an increase in modal diversity and an improvement in interchange facilities where sustainable onward journeys are the easiest option. London strategies recognize that coordinated ticketing is crucial and, with the uptake of Oyster and contactless bank cards, cash payment on buses has already ended.

The strategies consider that high-speed railways are under planning and construction, and that HS2, Crossrail and Crossrail 2 need to be fully integrated into the public transport network of London.

Crossrail, the new high-capacity, high-frequency railway line is scheduled to open in 2018, running over 100km from Reading and Heathrow in the west, through central London, to Shenfield and Abbey Wood in the east. Crossrail 2, which is supported by the Mayor of London, has been endorsed by the National Infrastructure Commission and its case has been acknowledged by the UK Government. Affordability of the scheme is currently under scrutiny in terms of cost and scope, funding and financing.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.5/10**

As a historic city, many of London's roads are relatively narrow. Freight delivery and construction operations cause congestion, and the city has little spare road capacity. Transport for London (TfL) is taking the lead in addressing these issues and, in addition to support provided by TfL to the London boroughs, the GLA's infrastructure team is helping key boroughs with logistics planning.

London has traditionally managed freight through a complex series of restrictions, notably the London Lorry Control Scheme, Congestion Charge, and Low Emission Zones. It has also tried to pursue a more positive policy based on working with businesses to improve freight efficiency and remove impact.

TfL has developed a world-leading program of Construction Logistics Plans (CLPs) and provides associated training courses to upskill professionals in the construction industry and in London's approving authorities. To date, 29 of the 33 London boroughs, which as planning authorities approve and police how developments are implemented, have completed the courses, meaning their boroughs are equipped to ensure CLPs are adequate and developers/constructors fulfil their construction logistics commitments.

Several freight consolidation centers serve London, and there are ambitions for expansion, achievable with the support of boroughs, operators and developers. TfL is encouraging the use of relatively temporary consolidation centers, to complement the permanent ones.

London has plans to move freight to off-peak times and to upgrade rail routes to allow freight to be transported around the city. Transport for London is also encouraging the use of London's railways and waterways for construction materials and other freight, to reduce congestion and hazard to pedestrians and cyclists.

Finally, the boom in online shopping has seen large increases in the numbers of delivery vans, increasing road congestion. TfL and private companies are developing new methods for 'last mile' deliveries, such as local consolidation centers combined with electric vehicles and electric assist cycles.

GLOBAL CONNECTIVITY

SCORE: **6.5/10**

London is one of the world's major aviation hubs, served by Heathrow, Gatwick, Stansted, London Luton and London City Airports. It has recognized the need to expand capacity, and Gatwick and Heathrow airports have campaigned particularly to be the airport that will gain an extra runway. The UK Government has put its support behind Heathrow and plans are progressing to bring about the capacity expansion. Environmental considerations such as noise and air quality feature large in the concerns of residents in areas in and around London, and enhancing connection links to and between the airports is a focus for the promoters and authorities. It has been suggested that the city should also consider increasing capacity at smaller London airports.

London supports the modal shift of freight to water and aims to achieve this shift by improving the connection of other transport modes, including from ports such as Tilbury.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **7.0/10**

Many current cycle routes are good, with the construction of the new cycle superhighways running from outer London into and across central London expected to be completed this year. More such cycle superhighways are planned.

The Strategy Cycle Network to 2041 gives planned routes and future connections as well as aiming to provide more secure, accessible parking.

Pedestrian zone plans are considered in the Pedestrian Safety Action Plan, and extending reduced-speed-limit areas in the future are also mentioned.

BUILT FORM: PARKING PROVISIONS

SCORE: **7.0/10**

The London Strategy acknowledges the importance of balancing the promotion of new developments and preventing excessive car parking provision. A list of parking standards aims to achieve this but current policy is linking parking restrictions to polluting vehicles, not the accessibility of public transport. A growing trend has been detected in London, particularly among younger adults, of not owning a car. It has even been suggested that in the next 15 years cars could be banned from central London as it runs out of road space.

FUTURE MOBILITY: SERVICES

SCORE: **7.7/10**

London is being proactive in encouraging new mobility services and in developing appropriate regulation, to deliver positive outcomes for Londoners.

London's environment encourages innovation. TfL's Director of Transport Innovation has described TfL's approach to future mobility as being 'pro-innovation', encouraging testing and growth of new mobility business models.

TfL will intervene where they see an innovation is not delivering good outcomes for consumers, or where an initiative contravenes TfL's policies (e.g. the development of a code of practice for bike share operators). London is at the forefront of how open data is harvested to enable mobility services: TfL makes its data available to app developers and similar for them to develop new services such as Citymapper.

In London a first wave of disruption was through ride sourcing on the taxi market. A less disruptive arrival is now being seen with the introduction of on-demand minibus services, with policy recognizing that, with the right application, they can be a key tool in reducing private car ownership.

Trial smart bus routes in London have led to City mapper's SmartRide, a real time, demand-responsive hybrid bus and taxi service, which currently serves a core central area. Data from its multimodal app, which itself draws on open source data made available by TfL, enables the company to fill transport network gaps. The potential of demand-responsive buses is also being investigated, with several operators testing the market.

Uber already provides ride sourcing services, and Daimler AG and Via recently started providing them in London. Many car club companies operate in London, and the Car Club Coalition aims for one million members by 2025 through the implementation of the London Car Club Strategy.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **7.0/10**

Future mobility transport technology is the subject of pilot studies in London, although there is no strategy yet for a widespread rollout. The Smart Mobility Living Lab is a new urban test-bed for self-driving technology in two London locations.

The potential for waterways, rail, consolidation centers and small electric vehicles (EVs), combined with web-based coordination and technology, to reduce road freight traffic is recognized, and TfL is actively encouraging all these avenues.

EV numbers exceed the 1,500 charging points in London but there are ambitions for 2,000 EVs by the end of 2020, and policies for one in five spaces to provide charging, may help lift the uptake. One problem is that about 60 per cent of London residents do not have a driveway or garage, restricting them to using on-street parking for EV charging. Access to sufficient grid electricity to serve public rapid charging points and electric vehicle fleet operations is necessary but currently expensive. Access is often difficult to achieve, and has led to alternatives such as smart charging solutions being explored.

London's historical layout of streets, not in a convenient grid pattern, is likely to stretch the capabilities of self-driving vehicles, and may limit widespread early adoption. Nevertheless, 5AI, a UK-based technology firm that provides self-driving platforms, has recently announced it will be bringing a self-driving taxi to the London market by 2021.

Like many UK cities London already has extensive urban traffic control systems will be important in realizing the most benefit from self-driving vehicles.

TECHNOLOGY
7.4/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

The Mayor of London highlighted the importance of developing London's digital infrastructure, and has recently appointed a Chief Digital Officer. Despite publication of the Smart London Plan, and engagement with various stakeholders on delivering on these ambitions to make London a smart city, more will be required to deliver a future ready digital infrastructure.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

At present, 77 per cent of London households do not have an ultra-fast broadband connection. London is now included in the first phase of BT Openreach's Fiber First program, which is tied to the national Digital Infrastructure Fund (DIFF). The fund aims to increase the number of homes with Fiber-to-the-Premises (FTTP) services in the UK. Although this strategy has funding from HM Treasury, other European cities are further advanced in this area, as well as in terms of connectivity ratios. Questions have been raised as to whether the funding will be sufficient.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **8.0/10**

Smarter London Together is the Mayor of London's 2018 'roadmap to transform London into the smartest city in the world'. It aims to coordinate connectivity and 5G projects, enhance public Wi-Fi in streets and public buildings, and support a new generation of smart infrastructure through major combined procurements. With London's Chief Digital Officer now appointed, these strategies for the widespread expansion of Wi-Fi, high speed internet and 5G communications technologies in London are being developed and progressively funded. There is a national level strategy that indicates the need to expand connectivity across the country.

OPEN DATA

SCORE: **7.5/10**

The Greater London Authority already makes data available to all citizens via the London Datastore, a free and open data-sharing portal where anyone can access data (currently 739 datasets) relating to London. In 2015 it won the international ODI Open Data Award. As well as data, the London Datastore offers apps and analysis, acts as a platform for data science projects, and helps bring London's boroughs together to solve city-wide problems. TfL also offers a range of open data feeds for free, available to developers of journey planning, transport, mapping and other apps.

INFORMATION AND DATA SECURITY

SCORE: **7.0/10**

As with all UK cities, London is covered by the new information and data security law — the General Data Protection Regulation (GDPR) — which came into effect on 25 May 2018.

PLANNING AND POLICY

SCORE: **8.0/10**

The development of communications infrastructure in London is now specifically addressed in the Mayor of London's Smarter London Together roadmap, and there is a national strategy to increase communications infrastructure (for example, under the DIFF). Funding is not all currently in place and is being assembled progressively.

URBAN SYSTEMS
6.8/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.8/10**

London's Climate Change Mitigation and Energy Strategy contains projections for renewable energy technology installations up to 2031, and supplementary planning guidance supports these projections. The Decentralized Energy Capacity Study investigated renewable energy potential in London, although no funding measures to implement these technologies were included.

Ofgem's Smart Cities Program aims to pilot smart grid technologies and accelerate deployment of smart meters. The Mayor has also set a target to generate a quarter of London's energy from decentralized sources by 2025, through three main policy frameworks: identification of energy opportunities, their delivery through the planning system and enabling commercialization of a decentralized energy market. Despite this policy framework, regulations are not favorable because transmission and distribution networks impose access charges that are relatively high and reduce the viability of investment schemes.

The new London Plan sets out a refocus to energy generation around heat pumps (including using secondary heat sources) and a move away from gas heating (as recommended in a WSP 2014 report), which will increase local generation for individuals and businesses, and reduce air pollution and CO_2 emissions.

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.3/10**

The chalk aquifer underlying London and the Thames Basin provides public drinking water. It is under threat from climate change effects of sea level rise, greater temperature fluctuations and repeated dry winters, as well as from growing urbanization.

Thames Water, London's main water supplier, has forecast demand as far ahead as 2100, and published its preferred plan for the period up to 2100. The plan includes a strategy to combine demand management and leakage control with resource scheme development, to secure long-term resilience. It draws on research assessing the potential effects of non-linearity in the onset of climate change impacts and extends out into Wiltshire and Oxfordshire, counties connected to the aquifer.

There are Water Resource Management Plans in place for each water company serving London. They cover future growth in supply and demand, climate change, reduction of leakage and promotion of water efficiency during the next 25 years. The Thames Estuary 2100 Project and Flood Risk Plan published in 2009 also suggest actions needed in the short, medium and long term for management of flood risk on the tidal Thames.

London's desalination plant has been in place since 2011 and was funded by the Department of Environment, Food and Rural Affairs and the Environment Agency. Additional desalination plant capacity is expected to be required in future. Water treatment development has included Thames Water implementing a storage and transfer project in which two tunnels can collect, discharge and treat wastewater, aiming to tackle the issue of sewer overflows during the next 100 years. The first has already been constructed; the other is in the process of securing funding.

Water quality is already high in London and there are no plans to improve it further, but the protection of the quality of waterways is included in the city plan.

WASTE MANAGEMENT

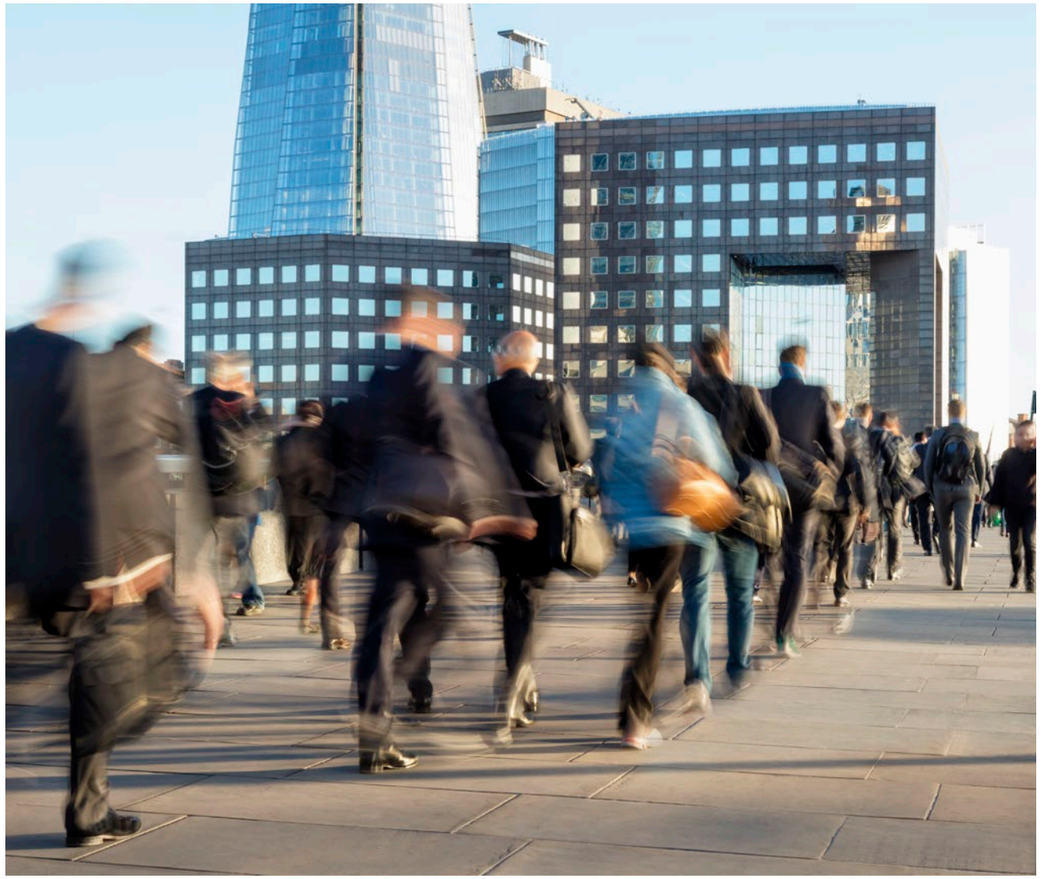
SCORE: **6.3/10**

London's Boroughs are responsible for providing local waste and recycling collections and procuring processing and treatment of the waste and recyclable material collected. They are actively seeking to reduce the amount of waste going to landfill.

There are several London regional waste authorities: groups of boroughs collaborate and designate the amount of land they need to receive, treat and remove waste. They contribute these forecasts to the London Plan and the GLA decides whether they are sufficient, although there is now a move towards a London-wide approach.

The London Plan includes plans to increase the capacity of existing waste separation and recycling infrastructure and the building of new sites, although they are still in the pipeline. There is no overall strategy for landfill remediation, although future proposals must be considered in line with the London Environment Strategy and landfill remediation is still taking place, for example on the Olympic Park site.

Recycling is encouraged, with targets in place, but there are no bans in place to control the generation of waste. Additionally, the support of material reuse is clear through promoting the circular economy, particularly demolition and building material reuse.



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12

Greater Manchester is one of Britain's most successful city regions, with a population of more than 2.7 million and an economy bigger than Wales or Northern Ireland. Its vision is to make its economy one of the best in the world and the city is making progress through a combination of economic growth and the reform of public services.

AT A GLANCE

RANKED **12**
CITY SCORE: **26.60**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.6/10	6.3/10	7.0/10	6.8/10

The leadership of the city has been strengthened over the last few years by the United Kingdom (UK) Government's drive for devolution. It has one of the UK's devolved administrations: the Greater Manchester Combined Authority is run jointly by the leaders of the 10 borough councils and the new Mayor of Greater Manchester, Andy Burnham. The authority also works with local services, businesses, communities and other partners to improve the city region. Boards, panels and committees look specifically at areas such as transport, health and social care, planning and housing. The Mayor and his Cycling and Walking Commissioner are highly visible both at a city level and nationally.

The population is forecast to grow to more than three million by 2035, which will place increasing pressure on housing, social infrastructure, transport and urban systems. These pressures need to be considered when assessing the suitability of these services for the future and included when developing plans.

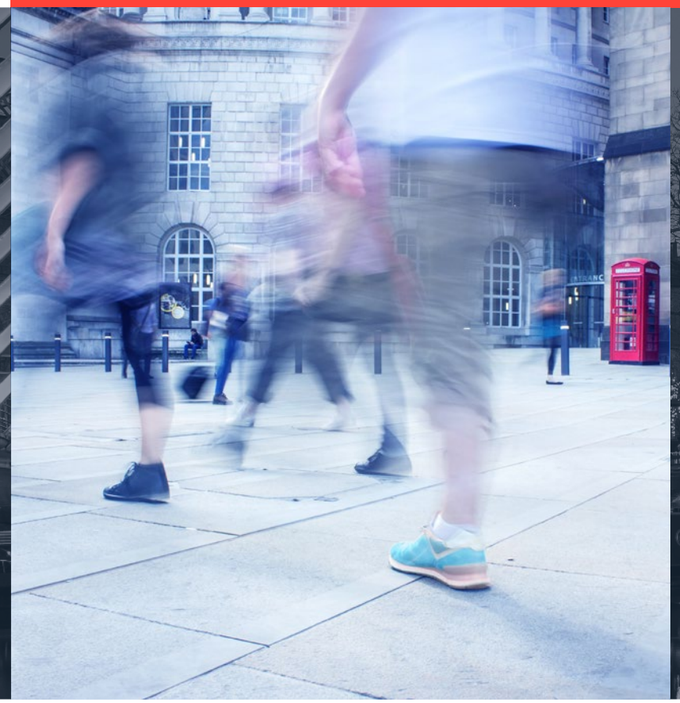
Manchester is a major European center and has moved towards becoming a 24/7 city. Urban intensification is happening on an epic scale, with a strong vision and value approach to transport planning — a shift from the more typical UK approach — and the funding to support it. Manchester's global connectivity via direct flights is probably the best in Britain after London Heathrow.

Control of health and social care provision was devolved to the Greater Manchester Social Care Partnership in 2016. Amid reports of a significant budget deficit for these services, additional central funding was announced meeting some of the reported gap.

The many university students share in the benefits of the city's internet access, which is as good as anywhere else in the UK. Manchester is likely to be top of the list when 5G connectivity arrives.

Earlier this year Greater Manchester's mayor hosted a Manchester Green Summit at which local leaders made several key announcements, including the ambition for Greater Manchester to become carbon neutral at least a decade earlier than 2050.

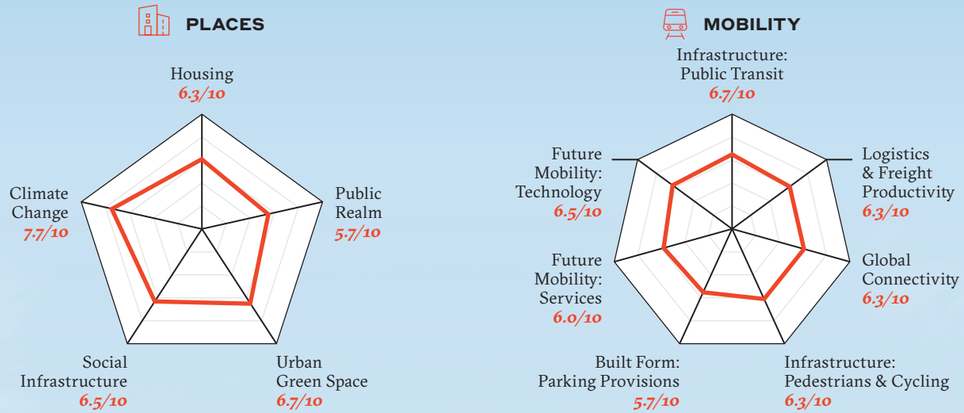


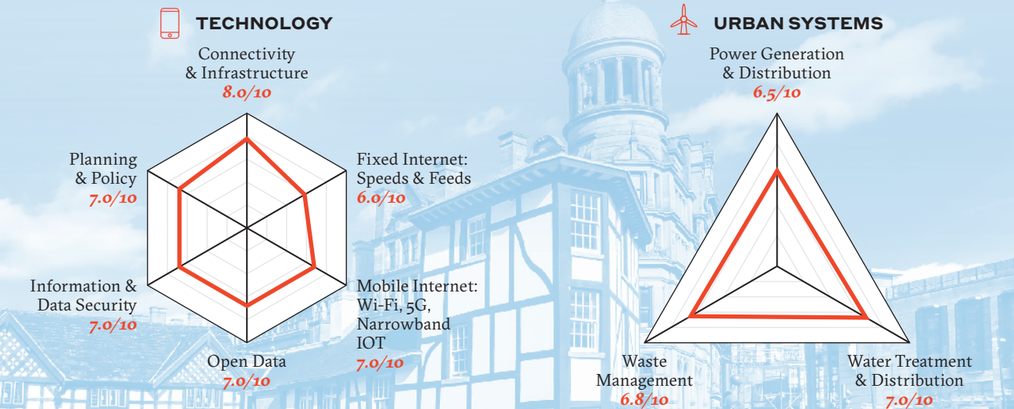




MANCHESTER

CITY ASSESSMENT





PLACES
6.6/10

HOUSING

SCORE: **6.3/10**

Manchester has developed a 15-year strategy to build 227,000 new homes in the city, 20 per cent of them affordable. This is based on a 2006 housing needs assessment, and is outlined as part of the core strategy. It also includes the need to consider amenities in housing development design.

Although the strategy has a long timeframe, it is unclear if the number of houses will be sufficient and where the funding will come from. The strategy covers the period from 2012 to 2027, not the impact beyond this time frame, although the 227,000 new homes compares favorably with the expected 300,000 population growth. All 10 Manchester borough councils are working together to ensure they have the land available in the right places and the required infrastructure to deliver the homes and jobs they need up to 2035.

The city encourages compact development, and on the back of strong demand for residential property, has invested in a lot of high-rise residential developments, bringing back into use brownfield sites within and surrounding the city center core and in Salford. Continued building in the city center is strongly influencing surrounding areas with development spreading outwards from the core. These developments have led to changes in movements within the city to increasing levels of activity including a thriving night time economy.

The strategy could result in green belt areas coming under pressure for development. About 25 per cent of the new homes will be built on greenfield sites. The councils are updating the 2016 draft spatial framework to maximize use of brownfield land and minimize impact on the green belt. The city also wants to bring all 12,000 or so empty homes back into use.

PUBLIC REALM

SCORE: **5.7/10**

Manchester has few shared spaces, in the past tending to follow a traditional approach of separating transport modes, in the face of big developments, including many high-rise buildings. However, the Transport Strategy 2040 is spatially themed and driven, moving away from the more traditional modal focus.

The strategy majors on how the city connects globally, across the North of England, between the regional center and the rest of the city region, but also down to better connecting neighbourhoods.

Manchester is a big university city and, despite big increases in the numbers of older people, it will continue to be a young city. Media City has brought considerable change to Manchester and the HS2 high-speed railway is expected to arrive about 2030.

Manchester has prepared a public realms strategy to ensure that a coordinated approach is taken to city development. It does this by considering if developments have appropriate funding and are designed to keep up with the pace of the rest of urban development in the city. This strategy will be supplemented by the city's StreetsForAll program.

Manchester has put a lot of investment into restoring the city's waterfront areas, particularly focused on the Salford Quays area. It is unclear what the future strategy will be in this area beyond any proposals and plans already in place.

URBAN GREEN SPACE

SCORE: **6.7/10**

Manchester City Council highlights that 20 per cent of the city is classed as tree-covered, that it has five river valleys, three canals, more than 160 parks, eight nature reserves and 38 sites of biological importance. Its plan for urban green space includes a Green and Blue Infrastructure Strategy and Action Plan, which aims to enhance existing and introduce new green infrastructure. It also includes calculations of percentage green infrastructure in Manchester and percentage tree canopy cover. Its headline vision says that, "By 2025, high quality, well-maintained green and blue spaces will be an integral part of all neighbourhoods with access to parks and green spaces and safe green routes for walking, cycling and exercise throughout the city." Importantly, it also says, "New funding models will be in place, ensuring progress achieved by 2025 can be sustained and provide the platform for ongoing investment in the years to follow."

The strategy aims to increase the percentages of green infrastructure and tree canopy, and points to areas for street tree planting along major corridors such as Alan Turing Way. The strategy also aims to increase the coverage of local nature reserves to meet the national guidance of one hectare per 1,000 residents, although possible areas for this and actions to achieve this are not yet identified. This approach to green space will help in the challenges to meet air quality targets for the city.

SOCIAL INFRASTRUCTURE

SCORE: **6.5/10**

The Greater Manchester Spatial Framework recognizes that an increase in population in Manchester will need to be supported by access to key social infrastructure. This involves the provision of additional school places required because of new developments, which must be considered during planning. Additionally, the framework supports the continued improvement of university facilities, although plans for achieving this are limited.

Similarly, with healthcare, developers will need to make provision for increased demands. Manchester is unusual in that control of the budget for health and social care was handed to the councils and health groups in 2016, which at launch had a set of five year targets. Possible expansion options are mentioned to increase healthcare facilities at the University Hospital South Manchester and to provide health centers for communities in Salford, Partington and Carrington. However, the availability of funding is not clear. Parent support is also considered in the Implementation Plans, which may include improving childcare facilities in Greater Manchester.

The core strategy for Greater Manchester mentions proposals to improve the appearance, use and accessibility of all cultural attractions, but further information is limited.

Homelessness and rough sleeping is a key priority for the Mayor who has a target to end the latter by 2020.

CLIMATE CHANGE

SCORE: **7.7/10**

The Manchester Climate Change Strategy 2017-2050 is a key part of the overarching policy framework of Our Manchester, and looks to improve the resilience of the city. Adaptation options are set out in the Implementation Plan 2017-2022, which will then be reviewed for the period 2023-2027 to allow the plan to be aligned with scientific and international development politics. The implementation plan lists actions around spatial planning, development and infrastructure investment and broader education actions. The Climate Resilient Cities and Infrastructure project is the latest of these projects, and runs until November 2018. Involving the University of Manchester and Greater Manchester as partners, its goal was to progress climate change adaptation goals in the city.

The framework also looks to improve the city's resilience to the social and economic impacts of climate disruptions, much of it by increases in education and engagement and business growth. These include a CAD1.4 million project led by Manchester universities to help to better understand the links between green infrastructure and the health and well-being of the city's older population. This will also help to evaluate the impact of a broader Green and Healthy pilot program. There is an additional CAD175,000 project with Tyndall Manchester and Manchester Museum, which aims to find innovative ways of engaging people in climate change as part of Climate Lab.

Manchester aims to become a zero-carbon city by 2050. Some projects have already begun, including the Greater Manchester Green Deal Communities Project, funded by CAD10.6 million from the national Department of Energy and Climate Change and Manchester's Carbon Co-op, which has secured European Union funding for a new smart meter technology project in which householders profile their daily energy use with the support of new apps and devices.

The Transport Strategy has priorities to deliver a low emission transport system by 2040 to enable it to meet its strong carbon reduction targets and eradicate transport related air quality issues.

MOBILITY
6.3/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.7/10**

Manchester has several strategies in place for future public transport, including the Transport for Greater Manchester (TfGM) 2040 Transport Strategy, Local Transport and Delivery Plans and annually updated five-year spending plans. Manchester is also at the forefront of Transport for the North's Strategic plans to deliver on regional connectivity across the Northern Powerhouse, and unlock major productivity gains and development potential regionally through the delivery of transport links.

Devolution gave Manchester control over many areas, so it is taking a holistic approach to transport. Recent transport investment — including the ambitious 'Big Bang' expansion of the Metrolink system — is a big success story. The diversity of transport modes in Manchester is indicated by HS2 and Northern Powerhouse Rail growth strategies, combined with a rapid transit network of Metrolink, suburban rail and buses including guided busway and supporting Park & Ride. However, plans to expand for expected increased high-speed railway capacity are limited.

Smart ticketing has been introduced on buses. Plans to extend this across all modes are discussed as well as improving interchanges at key nodes. Manchester's role as the linchpin of Transport for the North area which provides top level transport planning across the North of England, is also helping the city to continue increasing the performance of its local transport system.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.3/10**

Greater Manchester's freight strategy involves developing Manchester Airport as a global freight hub to provide additional logistics space and enhance capacity, along with the Northern Hub rail program, which will electrify lines and remove a rail bottleneck in Manchester.

The fact that the airport is well connected to the motorway network and that further improvements have been delivered over the past few years, enabling road based freight to be well served, is a positive step in the right direction, which the city region intends to continue driving.

The importance of balancing freight and passenger demand is recognized, as there are limited dedicated freight routes and no plans to increase them. However, capacity is expected to increase with the arrival HS2, and access charges are mentioned in the strategy to reduce demand. The potential of investment in the Port Salford to unlock inland shipping and make best use of the Manchester Ship Canal is recognized.

GLOBAL CONNECTIVITY

SCORE: **6.3/10**

There are ambitious plans to expand the passenger market at Manchester Airport with aims of reaching 35 million passengers a year by 2030 and 55 million by 2040, which are possible because of the CAD11.74 billion Manchester Airport Transformation Program due to be completed by 2020.

The airport currently has flights to international hubs and destinations right around the world, and is arguably the UK's second airport after Heathrow and the key airport for the North of England. Its role as a strategic asset to the Northern economy is recognized both in terms of attracting trade and inward investment, as well as skills.

The Enterprise Zone at the airport, including Airport City, the World Logistics Hub and the Medipark, is a key center for growth in the wider region and benefits from the global access facilitated by the airport. Port Salford is a tri-modal freight interchange and there are development plans to expand it to meet future freight capacity. This includes 150,000 square meters of logistics space as part of Phase 1.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.3/10**

The Velocity Program, funded by the Greater Manchester Council, aims to extend cycle paths and upgrade present routes to achieve 10 per cent of journeys by cycle by 2025. Beyond that, there are no plans in place to improve and upgrade this network. The CAD8.7 million Commuter Cycling Project planned to spend half the funding on improving cycle parking, but this project began in 2011. It is unclear whether these facilities will meet future demand.

The GM2040 Transport Strategy aims to increase the attractiveness of pedestrian routes through reallocating road space to add to the extensive network of footpaths. This, combined with the introduction of 32 km/h zones, may increase walking in Manchester, although the introduction of low-speed zones will depend on local support.

Bike share has started with Mobike recently offering effectively a new mode of transportation to local residents. This should unlock synergies with BeeLines' investment in walking and cycle network right across the city. The leadership of the council and its Walking and Cycling commissioner should help to turn many of the new plans into reality.

Finally, the StreetsForAll Strategy and proposals, which focus on place as well as mode of transport, are all positive developments to continue making cycling and walking easier in Manchester, contributing to better outcomes for local residents and visitors.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.7/10**

Parking standards in place outline maximum and minimum provisions for new development, although residential parking is not included. Aims to manage existing parking are included in the strategy and focus on increasing constraints in the city center, but these aims are not specifically linked to public transport.

Manchester is also transforming brownfield sites on the periphery of the city center core, which are currently used for informal car parking, with many being taken up by high rise residential and office development. The shift away from providing parking on the edge of the city center is being supported by expansion of Metrolink Park & Ride sites.

FUTURE MOBILITY: SERVICES

SCORE: **6.0/10**

Mobility as a service, ride-share and car clubs are briefly mentioned in TfGMs 2040 strategy. Some car club companies are already present in Greater Manchester, but the overall strategy to manage this is limited. For example, Mobike bike share has started providing a new shared mode of transport. Uber is also operating its app based private hire taxi provision, and more developments can be expected in the near future. For example, a Mobility as a Service trial was undertaken to gauge the behavioral response to the aggregation of pre-payment and information across a range of modes.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **6.5/10**

Funding of CAD8.7 million has been granted for a three-year driverless car pilot between Stockport Railway Station and Manchester Airport and a CAD4.7 million grant from Transport for Greater Manchester and 10 authorities aims to increase electric vehicle charging infrastructure.

Moreover, significant investment has been made in the traffic control systems within the city using new technology and trails of emerging data led solutions have been undertaken under the CityVerve project.

However, strategies for future uptake of these technologies and the extent of infrastructure needed are areas yet to be explored.

TECHNOLOGY
7.0/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Manchester has developed a digital strategy for 2016 to 2025 that highlights the importance of increasing communications infrastructure that has received funding and support. However, the strategy does not address the period beyond 2025.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

At present, only 65 per cent of Manchester households are connected to the ultra-fast broadband network. However, the city is now included in the first phase of BT Openreach's Fiber First program, which is tied to the UK's national Digital Infrastructure Fund. This fund aims to increase the number of homes in Britain with Fiber-to-the-Premises (FTTP) services. Although this strategy has funding from the Treasury, the strategy lags other European cities and critics argue the funding is insufficient.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

Manchester's digital strategy includes a commitment to increase the average mobile internet download/upload speed by as much as half or two-thirds. In addition, Manchester aims to secure national 5G test city status to position itself at the forefront of the next-generation 5G network. There is also a strategy to create a one login solution for public Wi-Fi in the city.

OPEN DATA

SCORE: **7.0/10**

Open data has been at the forefront of the TravelSpirit initiative which aims to capitalize on Mobility as a Service and Connected And Autonomous Vehicle opportunities. It was developed in Manchester and has grown across the UK and internationally.

By 2020, residents should be able to see what information is being shared by the public sector in Greater Manchester. In general, all cities and the national government should be able to provide open source data.

INFORMATION AND DATA SECURITY

SCORE: **7.0/10**

As with all British cities, Manchester is covered by the UK information and data security law — the General Data Protection Regulation (GDPR) — which came into effect on 25 May 2018.

PLANNING AND POLICY

SCORE: **7.0/10**

In addition to the national strategy to increase communications infrastructure, Manchester's digital strategy also addresses the need to improve connectivity.



URBAN SYSTEMS
6.8/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.5/10**

Manchester has plans to become a zero-carbon city by 2050 and the starting point for achieving it is a CAD26 million investment fund, although reports on the way forward have not been produced. As part of Horizon 2020, funding has been provided by the European Union for the Triangulum project, which aims to develop smart, low-carbon and energy-saving solutions.

The Core Strategy for Manchester aims to facilitate an increase in the use of low-carbon, decentralized and renewable technologies. Actions to achieve this are not detailed. The Energy Action Plan also has strategies to maximize the opportunity for supply of energy from renewable sources.

WATER TREATMENT AND DISTRIBUTION

SCORE: **7.0/10**

Manchester's water supply and wastewater treatment and disposal infrastructure is the province of United Utilities (UU). It has an asset management plan in place that aimed to invest CAD6.4 billion in their infrastructure between 2010 and 2015 and a Water Resource Management Plan (2015-2040), which assesses supply-demand availability and the impact of climate change. Manchester is not forecast to have deficit in supply in the future, although water trading has been outlined as an option. Desalination has been ruled out.

UU is also investing in treatment infrastructure, with a biogas upgrade at the Davyhulme Treatment Works as part of a CAD350 million modernization of the plant.

WASTE MANAGEMENT

SCORE: **6.8/10**

Manchester's waste separation and recycling infrastructure consists of:

- Materials Recovery Facility, which processes 90,000 tons of material each year
- Twenty household recycling centers
- Four mechanical biological treatment facilities with anaerobic digestion
- Thermal recovery facility.

These facilities have been developed to treat waste until 2029.

The Greater Manchester Waste Disposal Authority (now merged as part of the Greater Manchester Combined Authority) also manages and maintains four closed landfill sites, and has previously sold 12 landfill sites to POS Landcare in 2012.

Recycling and reuse is encouraged, although specific frameworks and bans are not in place. On the road to zero waste, Manchester plans to achieve a 50 per cent reduction to 400 kilograms in residual household waste by 2025. The strategy focuses on furniture and bicycle reuse.



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13

Auckland is a city that punches above its weight in a country that does the same. Enviably located between two natural harbors and their surrounding hills, New Zealand's most populous city is shaping itself for growth in the coming decades.

The Auckland region's population is a diverse melting pot with 59 per cent European, 23 per cent Asian, 11 per cent Maori and the remaining residents identifying themselves as mainly Pacific peoples.

The city invigorated the dockside Wynyard Quarter and Viaduct Basin in preparation for the 2011 Rugby World Cup and opened an exemplary new art gallery, kick-starting a renewal program that has brought a modern urban atmosphere to the city. This regeneration was timed to capture the imagination of global knowledge workers seeking a connected life in a smaller city.

Auckland is culturally rich, building on its history by putting Maori tradition at the center of communities and the city's brand.

The cultural and placemaking of the city has been bolstered by a major planning overhaul for growth and a renewed public investment in metro rail infrastructure, that will set Auckland well on the path to a stronger global position.

As with most growing cities, Auckland is navigating through some legacies including a highway and land-use system that leads most commuters to use private vehicles, and challenges surrounding housing affordability.

Forecasts to a little beyond 2040 suggest Auckland will be home to more than one third of the country's population. Will the city be able to cope with this growth? The city planning authority believes it will and is committed to making Auckland a special place that is renowned for its lifestyle and environment.

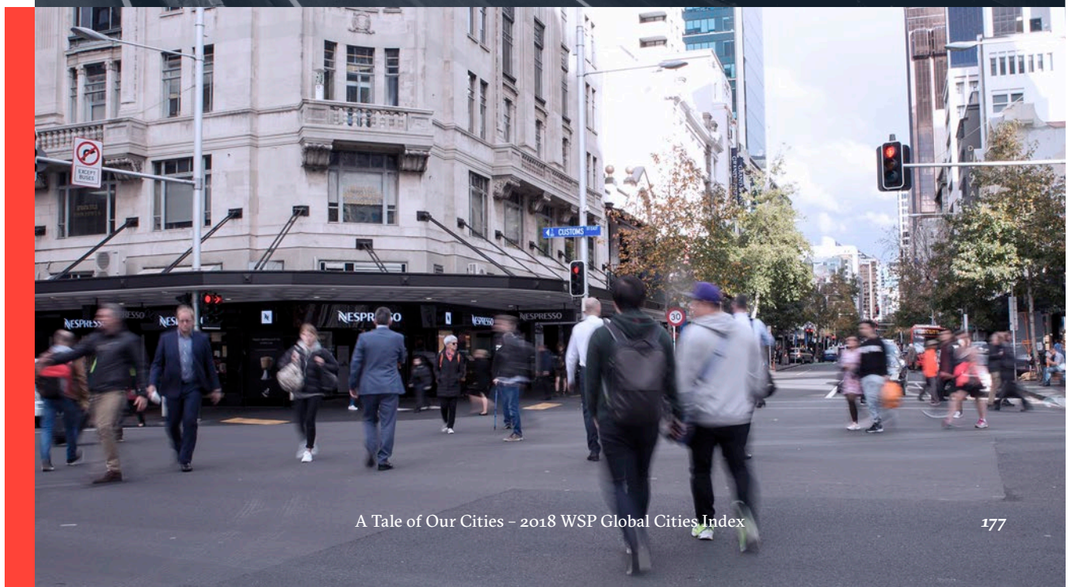
AT A GLANCE

RANKED **13**
CITY SCORE **25.76**

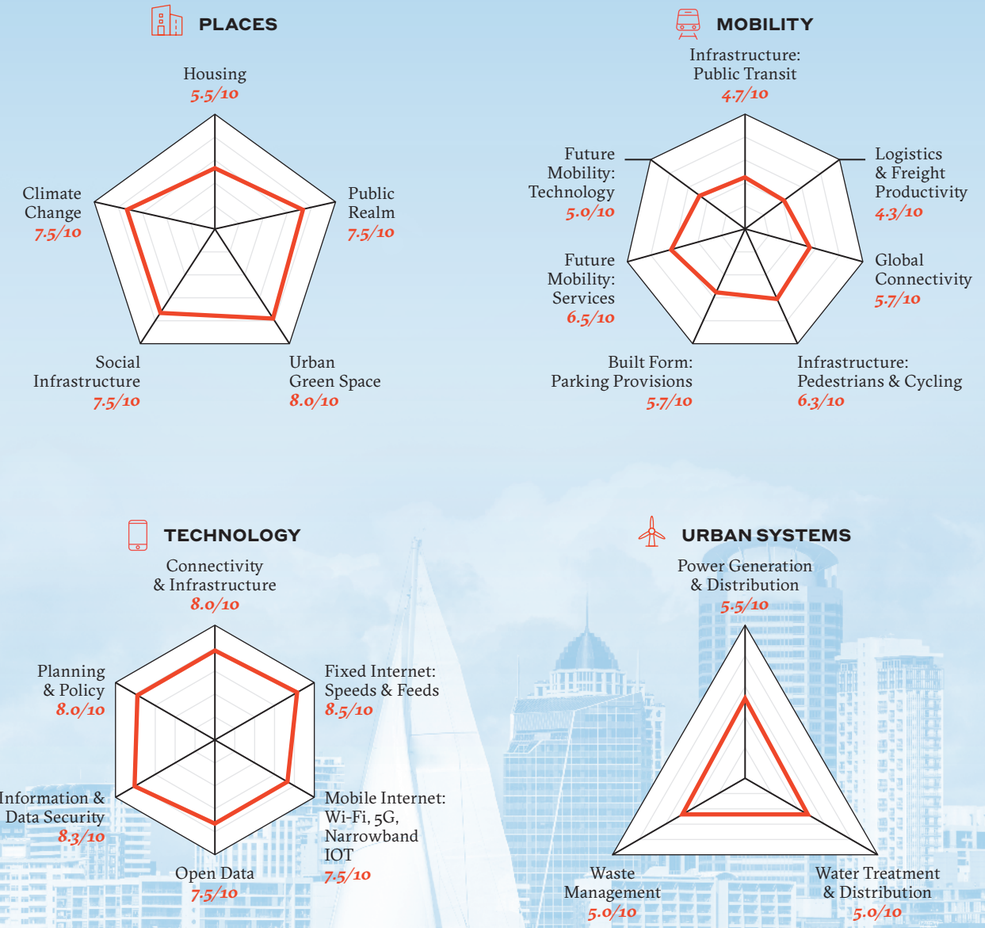
PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.2/10	**5.4/10**	**8.0/10**	**5.2/10**



AUCKLAND



CITY ASSESSMENT



PLACES
7.2/10

HOUSING

SCORE: **5.5/10**

The revised Auckland Plan 2050 sets out how the city will grow over the next 30 years, both in greenfield areas and through more intense development in existing urban areas. The Auckland Unitary Plan is one of the planning instruments that guides how Auckland will meet its residential needs. It sets a direction for a compact model of urban development and quality of growth.

Because of the strong population growth, central and local governments are focusing on the supply and affordability of housing. The Auckland Plan 2050 identifies the need to improve housing availability through several directions, including a quality urban form, accelerating the construction of homes and the provision of quality public spaces.

PUBLIC REALM

SCORE: **7.5/10**

One of the four key directions in the Auckland Plan 2050 is to provide public spaces and places that are inclusive, accessible and contribute to urban living.

The Auckland Design Manual provides planning guidance in areas such as buildings, parks, streets and neighbourhoods. Auckland also has an Urban Design Panel that reviews significant private and public developments in their early stages.

In recent years, several big transformational projects have contributed to the quality of the public realm. These include harbor edge and street upgrades in the central business district. More improvements in central city spaces in the public realm are also planned. Panuku Development Auckland has the specific role to rejuvenate parts of Auckland with a work program on various neighbourhood centers and other key public spaces such as the Wynyard Quarter.

Throughout the city, Auckland Transport has been building safe cycleways designed to encourage bike riding both for recreation and commuting. Since the first stage of the Nelson Street cycleway, the Lightpath and the Grafton cycleways were completed, and there has been a 46 per cent increase in the morning inbound peak cycle trips around the city center.

URBAN GREEN SPACE

SCORE: **8.0/10**

Auckland is also known as the City of Sails because of its many opportunities for yachting and boating on the Waitemata and Manukau Harbors and in the Hauraki Gulf. It also has an extensive network of regional parks as well as local open spaces for passive and active recreation. The parks include sanctuaries for New Zealand Indigenous species. Most of the regional parks are on Auckland's coastal margins and provide opportunities for day and overnight visits.

Many Local Board plans seek to increase and improve open space networks and sports fields, particularly in the high population growth areas.

The quality of Auckland's natural environment, including its harbor, islands, beaches and green spaces, is central to attracting visitors and permanent migrants. However, that same population growth has put the region under environmental pressure. The Health of Auckland's Natural Environment in 2015 report recognizes the projected growth will place pressure on the natural environment.

SOCIAL INFRASTRUCTURE

SCORE: **7.5/10**

Increased population growth has also resulted in big increases in some school enrolments and has put pressure on other community infrastructure such as health providers and hospitals.

Auckland has some internationally recognized universities, which are well-established in the city and residents have access to polytechnics and private training establishments.

In Auckland a number of initiatives are underway, these include the Tamaki Transformational Program (TTP) and The Southern Initiative (TSI).

The TTP is a 15- to 20-year regeneration initiative focused on three large suburbs in Auckland. It is a joint effort of the council and government through a development company. About 7,500 new homes are planned with associated social infrastructure such as schools, amenities and play spaces.

The TSI has three focus areas:

- Raising employment and skills
- Family and community health
- Promoting entrepreneurship though community-led economic development.

It has been described as a world-class, place-based initiative that combines several innovative approaches to shift outcomes in a community that has experienced some challenging issues for many years.

CLIMATE CHANGE

SCORE: **7.5/10**

As a member of the C40 Cities Climate Leadership Group, Auckland is committed to a 40 per cent emissions reduction by 2040 (from 1990 levels). The city's Low Carbon Strategic Action Plan lays out how to achieve this. The vast majority of Auckland's Greenhouse Gas (GHG) emissions are from stationary energy generation and transport.

The Auckland Transport Alignment Project is tackling transport emissions by establishing a low-emission, multimodal transport system for the region, improving cycling and encouraging the proliferation of electric vehicles. This includes a commitment to using only electric buses by 2025 and a zero-emission city center by 2030.

Auckland's stationary energy emissions are being reduced through fostering distributed renewable generation and energy efficiency requirements across infrastructure and buildings and guided by the Auckland Design Manual. More generally, and to reduce transitional risk, Auckland is helping its people to adopt low-carbon lifestyles. The city is committed to planting one million trees and is about to issue its first green bonds to fund green infrastructure assets and projects.

Demonstrating proactive transparency, Auckland commissioned climate change projections and impacts research for their region to support resilient and sustainable decision-making. Some of the key threats include a 30-centimeter sea level rise by 2050, increased temperature, heat stress, energy demand for cooling, invasive species and increased extremes in rainfall intensity, flow levels, dry and wet seasons, erosion and slope instability.

The long-term Auckland Plan 2050 draws on these findings when it lays out its Development Strategy and includes climate change risks and opportunities. Auckland is at the beginning of this resilience journey and is embracing innovative approaches. However, the urgent and considerable transformation of mobility systems and built form is required to meet the expected challenges in the next 30 years.

MOBILITY
5.4/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **4.7/10**

Auckland is growing rapidly. In the past few years, the rate of population growth has accelerated, from about 17,000 people each year from 2006 to 2013 to more than 40,000 since 2015, making Auckland the fastest-growing major city in Australasia. During the next 30 years, the city is projected to grow by up to a million people, accounting for 55 per cent of New Zealand's population growth in the next decade.

Due to its rapid growth and an historic underinvestment in transport infrastructure, Auckland has become increasingly congested. This means longer travel times and reduced journey time reliability, making it more difficult to reach employment, education, healthcare, shopping, recreation and other activities. Easy access to jobs and education is crucial to boosting Auckland's economic productivity and prosperity, as well as improving the quality of life of its citizens.

The government and Auckland Council agreed in 2016 to a transformative and visionary plan known as the Auckland Transport Alignment Project (ATAP). This is a game-changer for Auckland commuters and the first step in easing congestion and allowing Auckland to move freely. In 2018, ATAP was updated to reflect the priorities of the new Labor led Government, including the promotion of light rail and a greater focus on safety and access, assuming plans for an increased fuel tax are approved.

Auckland needs a transport system that provides a genuine choice for people, enables access to opportunities, achieves safety, health and environmental outcomes and underpins economic development. The aspiration must be to ensure it is a world-class city. Auckland's success is important for its citizens and for the country's long-term growth and productivity.

Auckland has benefited from a sustained increase in funding for public transport in the past decade or so, including electrification of the metro rail network, major investment in the bus system and most recently, the start of the CAD3.1 billion City Rail Link, which is the largest transport infrastructure project in New Zealand.

While public transport use has tripled since the mid-1990s, the overall demand for travel is outstripping the capacity gains and a further boost in public transport provision is needed. ATAP 2018 outlines the government's and the Auckland Council's shared direction for transport in the city. It is a transformative plan that includes accelerating the development of Auckland's rapid transit network through investment in light rail and new busways.

The draft Transport Agency Investment Proposal also signals the government's intent to invest in expanding public transport networks to provide increased choice and support a shift away from single-occupancy vehicles towards sustainable modes. For Auckland, new funding is identified for the rapid transit network that forms the backbone of the public transport system. It is recognized that investment in rapid transit will also have a significant impact on shaping urban form and development.

Buses account for more than 70 per cent of public transport boardings. Although the share of public transport trips made by rail and light rail will increase over time, most public transport trips are likely to continue to be made by bus. The ATAP 2018 includes about CAD192 million of investment in a comprehensive bus priority program. This investment will enable whole-of-route priority improvements for the most critical bus routes across Auckland and help realize operational savings through more efficient bus operations and increased ridership and fares.

Ferries make up about seven per cent of public transport ridership in Auckland. They will continue to play an important niche role in the public transport system, particularly in serving locations where travel by sea is much shorter (or in the case of Waiheke Island, the only option) than travel by land. Auckland Transport is in the process of completing a ferry strategy that will guide the long-term approach to developing Auckland's ferry network.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **4.3/10**

Increased travel times and poor reliability have a severe impact on the freight industry and the efficient movement of goods and services. Auckland has an important logistics function in the production and distribution of freight to the rest of New Zealand and internationally. Travel delays and poor reliability create substantial costs to businesses that are ultimately borne by all.

Freight in Auckland is expected to grow substantially in the next 30 years, with total freight carried projected to increase from 63 million tons to 109 million tons by 2046, an increase of 72 per cent. Freight kilometers' traveled are projected to increase by 53 per cent over the same period, with freight kilometers traveled within Auckland projected to rise by 85 per cent.

Analysis undertaken for the Ministry of Transport has found that 87 per cent of the 63 million tons was carried by road. Internal distribution and service trips make up most of the commercial travel within Auckland, with freight moved initially within Auckland before it is sent to its destination. Within Auckland, freight moves primarily on the state highways, motorways and arterial road network. However, a proportion is also moved by rail on the North Island Trunk Railway in conjunction with the inland port operations at Wiri and Westfield.

The key challenge will be to limit the growth in congestion on the freight network, particularly at peak times, and to improve the efficiency of connections to major freight hubs. ATAP 2018 identifies rail infrastructure improvements that would enable more freight to be transported by rail in the future.

Ports of Auckland Limited's main cargo wharves sit in a sensitive location adjoining Auckland's city center and harbor front. Port expansion and the intensified use of port facilities and the supporting road and rail links can have adverse amenity and environmental effects. Port activities and expansion proposals have attracted significant public concern and debate.

The container port can grow on its current footprint for about 20 years, assuming it continues to benefit from productivity improvements. For the proposed central wharves plan to proceed more wharf capacity is needed.

Many possibilities for the relocation of the freight port outside Auckland have been studied, but no easy solution has been found. Studies are continuing. The cruise ship, distribution and vehicle wholesaling industries generate significant economic benefits for Auckland.

GLOBAL CONNECTIVITY

SCORE: **5.7/10**

Last year, Auckland Airport handled about 19 million passengers. Much of the passenger growth has happened since 2014, along with a big increase in the number of international airlines using the airport.

The objective of the country's international air transport policy is to help grow the economy and deliver greater prosperity, security and opportunities for New Zealanders. This will be achieved by seeking opportunities for New Zealand-based and foreign airlines to provide their customers with improved connectivity to the rest of the world, and to facilitate increased trade in goods and services (including tourism).

In 2014, Auckland Airport announced its 30-year vision to build the airport of the future. Implementation of that vision is now underway — more than CAD900,000 is being spent every working day on aeronautical infrastructure to ensure that Auckland Airport can accommodate 40 million passengers and 260,000 flights by 2040.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.3/10**

Walking journeys account for 14 per cent of trips in Auckland but the variable quality and an unsafe environment can be a barrier to increasing the movement of pedestrians.

So far, walking improvements have typically been delivered as part of other investments, including general street upgrades and safety programs, shared spaces investments and CBD pedestrian crossings upgrades. A dedicated walking program would enable a more proactive approach to improvements. Present approaches are generally reactive and constrained by a tiny annual budget of about CAD3.6 million for new footpaths.

Ensuring Auckland street design standards focus on providing safe and attractive facilities for pedestrians is also key to improving walkability. These standards have been updated recently to place greater priority on pedestrians. They now need to be fully integrated into business-as-usual activities, such as road maintenance and renewals, if they are to promote change and create more walkable environments.

The draft Government Policy Statement on Land Transport places a higher priority on encouraging walking, including supporting projects previously funded outside transport budgets (e.g., town center upgrades). Further work is needed to understand the financial implications of these changes.

In the past few years, investment in cycling has doubled, from less than CAD18 million in 2013 to about CAD36 million in both 2016 and 2017. Most investment has focused on providing safe and protected cycling infrastructure, which previously only existed along a few corridors in Auckland. Despite this recent increase, Auckland's safe cycling network is still very undeveloped and will take sustained investment and effort to be completed. A program business case to guide the next 10 years of investment in cycling was approved by Auckland Transport and the NZ Transport Agency last year. The analysis undertaken as part of this work emphasized the need to provide complete networks and improve cycling infrastructure in an area-focused way to achieve the greatest gains. This work fed into developing the ATAP. Overall, about CAD573 million of investment in cycling infrastructure has been included in ATAP.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.7/10**

Historically, Auckland authorities required minimum parking ratios for developments, leading to big expanses of off-street car parking in and around metropolitan and town centers. The strategic direction for parking is set out in the Auckland Plan, the Auckland Unitary Plan, the Regional Public Transport Plan and in Auckland Transport's (AT) strategic themes. This includes the introduction of maximum car parking ratios in the central city and around town centers.

AT's objectives for the management and supply of parking in Auckland are to:

1. Prioritize the safe and efficient movement of people, services and goods on the road network
2. Facilitate a transformational shift to public transport
3. Provide an outstanding customer experience at AT-operated on- and off-street facilities
4. Support the economic development of the Auckland City Center, metropolitan and town centers
5. Support placemaking, amenity and good urban design outcomes
6. Ensure a fiscally responsible approach to providing, managing and pricing parking facilities and that benefits cover the costs.

AT's parking policy on wider regions is set out in the policy document entitled Criteria for the development of Comprehensive Parking Management Plans (CPMPs). CPMPs provide guidance on how to manage parking in centers and other locations with parking demand pressures in the short, medium and long term based on analysis of local circumstances. CPMPs include recommendations and supporting evidence to enable AT to implement measures to manage parking including introduction of restrictions or pricing. They will also help decisions about divesting, retaining or providing more parking to meet future demand.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

The strategy being developed by AT recognizes that a customer's journey begins with the commute from home to the nearest transport hub and ends with a similar commute home. The connecting journeys before and after a public transport ride can also be influential enough to encourage or discourage a person to take public transport. Therefore, AT is planning to improve first and last leg connections to transport hubs. These strategies will facilitate a seamless and convenient travel experience for its customers. They will also make public transport more accessible to potential customers who are expected to increase use.

AT is trialing an on-demand ride-share service to address customers' first and last leg connections. The service will use six electric vehicles and operate within a three-kilometer radius of the Devonport ferry terminal on the North Shore initially. Customers will communicate with the service through a mobile application to book, manage and pay for services as well as monitor vehicle location and expected pick-up times.

Dedicated on-street parking spaces for shared vehicles are provided around the city, but they are not widespread and nor is the uptake of this model.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

AT and the Transport Agency have signed a Technology Partnership to cocreate a 10-year future transport technology roadmap and strategy that includes:

- Intelligent transport systems
- The introduction, extension and use of mobility as a service and Mobility Operating Systems (MOS)
- Technology that will support Auckland Transport Operations Center, CCTV and Analytics predictive modelling
- Any future dynamic pricing systems
- Management of third-party suppliers of transport technology solutions
- Leading the communication and promoting the program of work.

Nationwide, the Transport Agency is committed to delivering a step change for customers using digital technologies. It wants to grow a digitally-savvy, innovative culture within its agency and the wider sector. In Auckland, alongside their journey planner and real-time information systems, AT is trialing RideMate, a pilot project for the Auckland Airport.

The Ministry of Transport is working to clarify the legal situation for the deployment of autonomous vehicles in New Zealand, although there are no obvious legal barriers to their testing. Unlike some countries, the country has no explicit requirement for a driver to be present.

Unmanned Aircraft Systems (UAS), or drones, Unmanned Aerial Vehicles (UAV) or remotely piloted aircraft systems, are rapidly gaining popularity, both commercially and recreationally. They are being used in scientific research, engineering, film and TV production, photography, agriculture, power line inspection and search and rescue work. In the future, we may even see UAS being used for goods delivery.

The government is committed to having a thriving and successful UAV sector. UAV use in business is an innovative direction the government is keen to support as it will bring the commercialization of new products and services, creating more jobs for New Zealanders. New UAS safety rules came into effect in 2015.

All New Zealand universities are now using UAS as part of their research efforts. Massey University is offering UAV pilot training. An area of restricted airspace in New Zealand has been set aside specifically for the testing of UAV by the University of Canterbury's Spatial Engineering Research Center.

New Zealand is well-placed to benefit from Electric Vehicles (EV). More than 80 per cent of electricity is generated from renewable sources and there is enough supply for widespread adoption of EVs. Even if every light vehicle were electric, there would be sufficient generation capacity, provided most were charged at off-peak times. Auckland already has many places where batteries can be charged.

In May 2016, the government announced its Electric Vehicles Programme that plans to double the number of EVs on the road each year to reach 64,000 by 2021. Presently, there are 7,600 EVs. While no subsidies are available for private EV purchases, New Zealand is now able to access EVs from second-hand markets and, as a legacy of the previous government, EVs are presently exempted from paying road user charges. A contestable fund was set up by Energy Efficiency and Conservation Authority (EECA) to support infrastructure and increase public awareness and acceptance of EVs and support innovative trials. The new Green Investment Fund identifies opportunities for coinvestment to grow EV uptake and sustainable modes.

TECHNOLOGY
8.0/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Well-developed physical and digital infrastructures affect productivity directly by connecting economic agents, reducing transaction costs, easing the effects of distance and time, facilitating the flow of information, and facilitating integration of markets into global value chains. Information and Communication Technologies (ICT) are becoming increasingly important and there is growing empirical literature that they facilitate innovation and lift company and country productivity by giving decision-makers more complete information.

Auckland does not have a standalone digital strategy, but the city is becoming increasingly prominent in the innovation and technology space through a combination of population density, widespread availability of fiber and fast internet, and the number of private companies investing in digital technology and innovation both individually and collaboratively.

GridAKL is one such collaborative space, in the Wynyard Quarter innovation precinct of Auckland, which houses organizations such as WSP Opus, Air New Zealand, Datacom, IBM, HP, Microsoft, Fonterra and Emirates Team New Zealand (holder of the America's Cup). The innovations driven by these organizations have widespread effects for both the city, New Zealand and the global community. Auckland Council, through Auckland Tourism, Events and Economic Development, has driven the creation and community-building associated with the Wynyard innovation quarter.

The New Zealand Government, through the Ministry of Business, Innovation and Employment, is leading a Digital Economy work plan aimed at supporting the growth of the country's digital sector and the uptake and smart use of ICT across the economy.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.5/10**

Traditionally, internet services have been provided via copper wires initially designed to support landlines. Fiber optic cable is replacing copper wire in most countries. Fiber is a fixed-line internet that can support much higher bandwidth for multiple users than the copper wires it typically replaces. It is made from glass, uses light to transmit data over long distances and is far superior to copper wire. It is essential to support both consumers and businesses as we become more dependent on our ability to receive and transmit large volumes of rich media content and information.

Auckland has almost complete coverage for fast internet connectivity across the city. Most properties can access ADSL, VDSL and increasingly fiber for their connectivity requirements. The fiber rollout in Auckland is nearing completion, and will enable most citizens to access fiber broadband in their home or business. Gaps in coverage are being addressed through the Rural Broadband Initiative and through Broadband over LTE (BoLTE).

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.5/10**

Each new generation of cellular technologies has brought us greater functionality available in more places with ever faster access to information. In almost all cases, these improvements have been accompanied by decreasing access and usage costs resulting in mobile devices becoming an essential and ubiquitous tool for communications, content digestion and content creation. The evolutionary 5G will give wireless broadband the capacity it needs to power thousands of connected devices in homes and workplaces.

Spark New Zealand, as the largest telecommunications provider, in March 2018 begun the initial pilot of 5G through the launch of a pilot vehicle equipped with 5G connectivity alongside the installation of 5G equipment in a Wellington exchange building. Other New Zealand telcos are following suit, with consumers being told that 2020 is the target date for 5G to be widely available. As the country's largest and most populous city, Auckland is a natural target for early adoption.

Narrowband Internet of Things (NB-IoT) is a Low Power Wide Area Network (LPWAN) radio technology standard developed to enable a wide range of devices and services to be connected using cellular telecommunications bands. It is the backbone of connectivity for the IoT. NB-IoT focuses on indoor coverage, low cost, long battery life and enabling many connected devices. The move towards autonomous vehicles and connected infrastructure will make reliable, robust access and connectivity essential.

Spark and its competitors, Vodafone and Kordia, are all in the process of rolling out NB-IoT networks to support the burgeoning growth in IoT devices and demand for such connectivity. In addition, international providers such as AT&T are also entering the New Zealand market with IoT offerings to suit different needs. Auckland Council, Auckland Transport and the New Zealand Transport Agency are showing interest in IoT to enable easier monitoring and management of their infrastructure networks, whether its street lighting, road corridors, water networks or other critical infrastructure.

As more people and devices are connected and depend on the internet, the complementary wireless technologies of 5G and NB-IoT will become redefined as part and parcel of our critical infrastructure.

The availability of Wi-Fi is essential for both personal and business applications. Many cities recognize this and provide free public Wi-Fi access both through commercial providers such as telcos and businesses (such as cafes) as well as by the responsible authority themselves. Regardless of who is providing the free public Wi-Fi, access and availability enable citizens and visitors to easily access a range of services at no cost.

Following the 2011 Christchurch earthquakes, a key lesson was that the easy availability of public Wi-Fi made a significant difference to the ability of people to connect with loved ones. Spark New Zealand had an existing infrastructure of telephone boxes with power and connectivity. It used that infrastructure base to add Wi-Fi to the offering so that Spark customers who are near a Spark telephone box can connect to Wi-Fi for free rather than using mobile data. This has created an extensive Wi-Fi network nationwide, which has the biggest coverage in cities such as Auckland. Auckland also has wide availability of public Wi-Fi through individual merchants (and public services such as libraries) who now provide Wi-Fi access for customers while they are in-store.

OPEN DATA

SCORE: **7.5/10**

Open Data is the idea that some data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control. There is a global movement in developed countries for governments at all levels to make their vast amounts of public data freely available.

The State Services Commission is leading New Zealand participation in the Open Government Partnership to dramatically increase transparency to the public of the machinery of government, increasing accountability and enabling broader participation in the democratic process. Opening official information can also support technological innovation and economic growth by enabling third parties to develop new kinds of digital applications and services.

Open government applications seek to empower citizens, to help small businesses, or to create value in some other constructive way. Auckland Council, Auckland Transport and the NZ Transport Agency have all begun to make data publicly available to allow private companies and citizens to leverage that data for additional public value. On the Auckland Motorway Alliance, all partners are provided equal access to the data and underlying intellectual property associated with the systems that are run on the motorway network including congestion monitoring and modelling and sensor data.

INFORMATION AND DATA SECURITY

SCORE: **8.3/10**

Citizens using services, and especially government services, must be confident that:

- Any information they provide is confidential and stored appropriately
- The system they are using is safe and secure
- They know how their information will be used
- They can easily retrieve any information they provide.

If a service cannot guarantee confidentiality, integrity and availability of the system, people will not use it.

The presence of strong legislative and regulatory forms of protection for data security and privacy is essential to sustain confidence and usage of online sites and information. New Zealand has comprehensive privacy and data protection legislation, and, in addition, the Government Communications Security Bureau publishes the New Zealand Information Security Manual (NZISM), which includes minimum technical security standards for good system hygiene, as well as providing other technical and security guidance for government departments and agencies to support good information governance and assurance practices.

The NZISM is publicly available and is often used by private sector companies wishing to leverage the work done by the central government to inform their own activities and controls.

PLANNING AND POLICY

SCORE: **8.0/10**

The Ministry of Business, Innovation and Employment (MBIE) is the government body responsible for delivering the Digital Economy Work Plan (DEWP) and is also the agency with national responsibility for business and the ongoing productivity of the New Zealand economy. Typically, local authorities in New Zealand are not resourced to duplicate the efforts of MBIE, so they tend to leverage the central government outputs to inform their own local planning. The existence of the DEWP, together with the political support evident in producing and implementing it, is a positive indicator of future readiness.

The Auckland Tourism, Events and Economic Development is the council body responsible for the planning and promotion of the initiatives that result from it.

New Zealand already has a Chief Scientist and is recruiting a Chief Technology Officer, who will further strengthen the development of policy and the execution of specific initiatives that deliver value for NZ Inc.

URBAN SYSTEMS
5.2/10

POWER GENERATION AND DISTRIBUTION

SCORE: **5.5/10**

Power generation for Auckland is predominantly provided by three big New Zealand generation companies in which the government holds a majority stake (Genesis Energy, Mercury and Meridian Energy) and by two private sector companies (Contact Energy and Trustpower). Power generation is largely from sustainable energy sources such as hydro, geothermal, wind and to a lesser extent non-renewables sources such as gas and coal, with generation situated in remote locations. The city relies on the state-owned national Transpower transmission system to transport power from these remote locations to Auckland.

The national transmission network feeds into the Auckland-wide distribution network, owned and operated by Vector. Vector is one of 29 distribution companies in New Zealand that, along with Transpower, is regulated by the Commerce Commission. Vector is majority owned by a private sector trust. Some smaller-scale generation is included in the Vector network, including network level battery storage. The distribution system in early in 2018 has been found to be susceptible to extended outages because of more frequent storms affecting the large portion of the network conveyed via overhead lines.

Vector has a target of 100 per cent renewable electricity generation by 2035, which is aligned to the government's wider goal of a carbon-zero New Zealand by 2050.

WATER TREATMENT AND DISTRIBUTION

SCORE: **5.0/10**

Auckland's three main water sources are dams in the Hunua and Waitakere ranges, an aquifer in Onehunga and the Waikato River, providing adequate capacity for future demand and flexibility to adapt to droughts or plant outages.

As Auckland grows the pipe network will need to be expanded to meet demand without compromising on the delivery of reliable, safe and efficient water services. In 2016, the water network had the capacity to allow 45,000 new houses to connect. During the next 10 years, the network will need to be expanded to provide for a further 195,000 homes. More pipelines and reservoirs will be required to improve connectivity within the system to meet demand and provide resilience during system outages.

Auckland's two main wastewater treatment plants process most of Auckland's wastewater to a high standard (tertiary treatment). The other 16, much smaller, regional treatment plants are being progressively upgraded to provide similar standards of treatment.

A regional approach is being adopted to address growth and improve resilience, with additional infrastructure being built to efficiently distribute wastewater across the network to maximise the use of existing assets and increase connectivity.

The central part of Auckland is still served by a combined system with pipes transporting both wastewater and stormwater. In rain events, diluted wastewater is discharged directly into Auckland's harbors. In other sections of the network, where there are separate wastewater and stormwater pipes, stormwater and groundwater is entering the wastewater network causing wastewater to overflow during heavy rain. The frequency and volumes of overflows will increase with population growth and climate change without further investment in infrastructure. Significant investment is planned in new infrastructure to augment the capacity of the existing wastewater system to mitigate these risks. Additional infrastructure will be required to reduce the amount of stormwater entering the wastewater system.

Improvements to the stormwater system are required to:

- Reduce flooding to open areas for development
- Remove stormwater flows from the wastewater system
- Improve the quality of water discharged to the receiving environments
- Increased expenditure will be needed in the next two decades on all three water systems to renew existing assets as they reach the end of their useful lives.

WASTE MANAGEMENT

SCORE: **5.0/10**

Auckland sent 1.174 million tons of waste to landfill in 2010. This represents about 0.8 tons of waste for every person in Auckland. The waste includes a significant quantity of material that, if separated, could be recycled and used.

Auckland adopted a waste minimisation plan in 2012 that outlined an ambitious transformation program with the aim of achieving zero waste to landfill by 2040. A Resource Recovery Network was to be developed in the next decade with 12 community recycling centres being established. So far, five have been established.

Other actions include a move from weekly to fortnightly kerbside refuse and recycling collection for domestic users, measures to support business waste reduction, developing waste-exchange and waste-brokering services and increasing education and community development programs.



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MELBOURNE

Fashion, sport, music, hipster-culture, coffee, lanes, trams, theatre and the riverside. They are the things that have made Melbourne one of the most livable cities and the epitome of modern urbanism.

AT A GLANCE

RANKED **14**
CITY SCORE: **25.60**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.7/10	**6.7/10**	**7.0/10**	**5.2/10**

As Australia's cultural and sporting capital, Melbourne hosts important global and national events: the Australian Formula 1 Grand Prix, Melbourne Fashion Week, the Australian Open tennis tournament, the Melbourne Cup, the Australian Football League Grand Final and the Boxing Day Cricket Test at the Melbourne Cricket Ground. Melbourne's excellent venues make it a priority stop for the global arts — theater, music and dance — while the city also supports a thriving local arts sector.

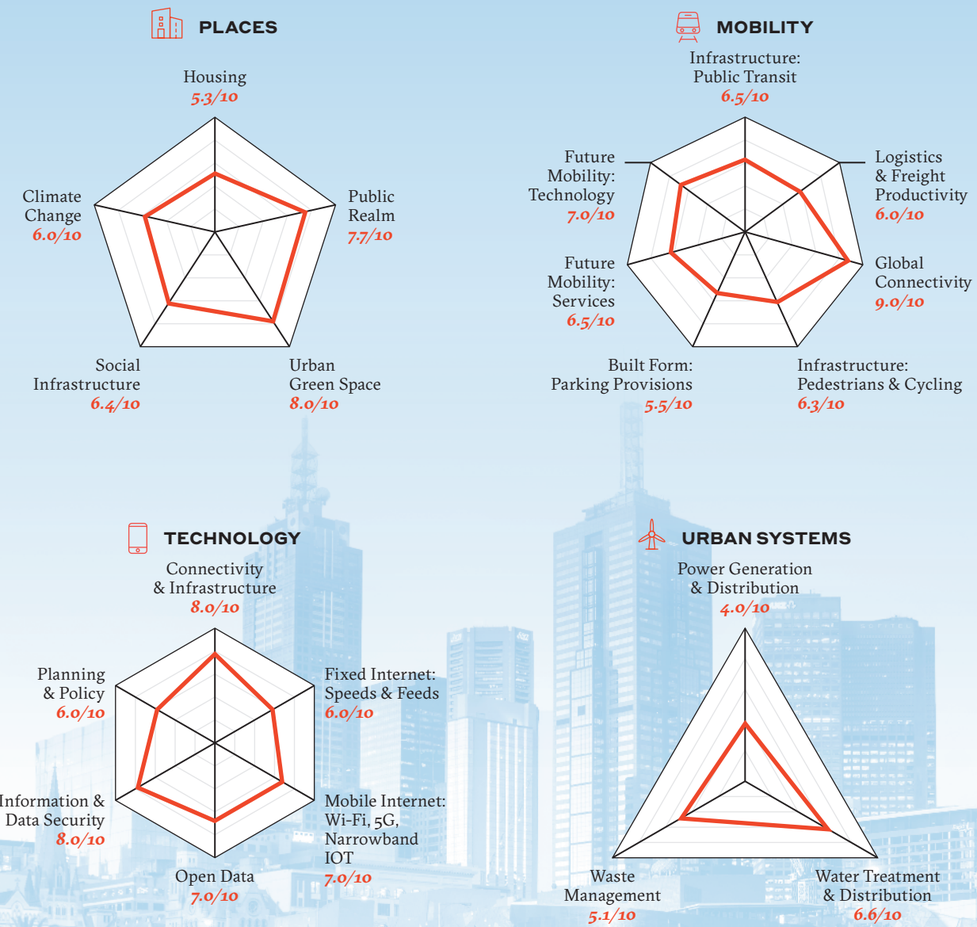
Melbourne is also a fast-growing city. High national and international immigration has it on track to supersede Sydney as Australia's largest city by mid-century. Like all of Australia's major cities, it has a heavy reliance on private motor vehicles for mobility. However, the investment in Melbourne Metro and other major infrastructure projects will see an uplift in public transport patronage.

The city has housing affordability challenges, albeit they are less pronounced than other cities with such high livability.

Governance in Melbourne follows a familiar pattern of fragmentation between disparate local councils and the state government, with cooperation between levels of government needed for effective implementation of land use and transport planning.

Melbourne has cemented its place as a leading city for people and is on the journey of creating places and infrastructure that will continue to make it the choice for citizens and visitors.

CITY ASSESSMENT



PLACES
6.7/10

HOUSING

SCORE: **5.3/10**

The population of greater Melbourne is growing at a faster rate than Sydney. Should present trends continue, it could usurp Sydney as Australia's biggest metropolis by mid-century. One reason is that land supply is less constrained, particularly on the urban fringe, and therefore house prices are comparatively lower. Housing provision opportunities in the inner and middle-ring suburbs must be realized to ensure that Melbourne grows in a sustainable manner.

The overarching planning document dealing with housing is Plan Melbourne 2017-2050. One of the key recommendations is for Melbourne to provide housing choice in locations close to jobs and services. For this to happen, Melbourne will need to:

- Manage the supply of new housing in the right locations to meet population growth and create a sustainable city
- Foster more housing closer to jobs and public transport
- Increase the supply of social and affordable housing
- Facilitate decision-making processes for housing in the right locations
- Provide greater choice and diversity of housing.

Direction 2.3 of Plan Melbourne looks to increase the supply of social and affordable housing by utilizing government land and streamlining decision-making processes for social housing proposals; strengthen the role of planning in facilitating and supplying social and affordable housing; and create ways to capture and share value uplift from rezonings.

The Victorian Government has introduced policy and legislative measures to strengthen the role of planning. The Homes for Victorians policy document outlines a series of measures to increase the supply of social and affordable homes. Both Plan Melbourne and Homes for Victorians policy documents stop short of setting housing targets, instead devolving responsibility for setting those targets to councils. There is no guidance on housing targets by region to meet and balance the projected housing demand, bringing into question the city's ability to grow sustainably.

The Victorian Government has introduced changes to the Planning and Environment Act 1987 to give a clear legislative framework and definition on the matter. The changes that came into effect on 1 June 2018 include a new objective "to facilitate the provision of affordable housing", a definition of affordable housing, and confirmation that a responsible authority "may enter into an agreement with an owner of land for the development or provision of land in relation to affordable housing".

PUBLIC REALM

SCORE: **7.7/10**

Melbourne is renowned for its diverse and high-quality public realm. The city has a wide variety including bustling city center streets, vibrant lanes and generous parklands across the city's inner-, middle- and outer-ring suburbs.

Plan Melbourne sees a need to adopt a placemaking planning approach to raise the standard of urban design of public places the city's suburbs. This includes adopting a more focused approach to strengthen the design quality of public spaces and the interfaces between private development and the public domain. The region plans do provide some spatial overview of the public open space provision for each region. The responsibility for delivery of this ambition within the Urban Growth Boundary is primarily devolved to councils and the mechanisms for implementation are not clearly outlined. The Victorian Planning Authority also has a remit (of sorts) to define the public realm through the precinct structure planning process for those precincts deemed to be of strategic importance to the city.

Detailed design of public realm is left to local authorities and/or developers who are managed through the planning process. Planning controls have been tightened in recent years to ensure that good design outcomes for the public realm are realized in consultation with the community and local authority.

URBAN GREEN SPACE

SCORE: **8.0/10**

Within the Urban Growth Boundary, the region plans provide some spatial overview of the public open space and water's edge parkland. There is no specific emphasis on urban green space.

Plan Melbourne also supports some green space policy initiatives, including:

- Improving neighbourhoods to enable walking and cycling as a part of daily life
- Developing a network of accessible, high-quality, local open spaces
- Supporting community gardens and productive streetscapes.

Victoria's 30-year Infrastructure Strategy also includes a recommendation to increase the amount and quality of green infrastructure in an urban setting to support a range of outcomes, including creating open space for planned and incidental exercise, improving biodiversity by increasing forested and planted areas and supporting water-sensitive design to mitigate flooding. As with the public realm, responsibility for delivery of urban green space sits with councils. The City of Melbourne, for example, aims to establish an urban forest that will be resilient, healthy and diverse, and will contribute to the health and wellbeing of the community. Plan Melbourne does identify the green wedges and peri-urban areas outside the urban growth boundary that are to be preserved.

SOCIAL INFRASTRUCTURE

SCORE: **6.4/10**

A range of recommendations in Victoria's 30-year Infrastructure Strategy deal with meeting the community's changing needs from a social infrastructure perspective. These include education, sport and cultural, education, healthcare and childcare infrastructure.

Plan Melbourne addresses the need to invest in social infrastructure and wants to see a whole-of-government approach: the creation of health and education precincts to support neighbourhoods; support not-for-profit community services to build social capital and stronger communities; and the provision and protection of land for cemeteries and crematoria.

The Victorian Government is spending on school infrastructure but arguably this is more reactive than proactive. All policy documents would like schools' infrastructure demand management to be more proactive.

Melbourne has several world-recognized universities and each is expanding in partnership with government and industry in planned innovation precincts for health, engineering and science, which is aligned with strategic investment in new infrastructure.

CLIMATE CHANGE

SCORE: **6.0/10**

The Victorian Climate Change Framework identifies the importance of both adaptation and the removal of greenhouse gas (GHG) emissions from the state economy with a target of net zero GHG emissions by 2050. The interim 2020 target is 15 to 20 per cent below 2005 levels. Reduction of emissions is being fought on four fronts: increasing energy efficiency and productivity; moving to a clean electricity supply; switching to clean fuels; and reducing non-energy emissions and increasing carbon storage. The Climate Change Framework is also integrated into a range of state policy documents and in Plan Melbourne.

Melbourne has been quite successful in its urban greening program and councils are continuing the push.

Sea level and coastal inundation risks also pose long-term climate challenges, particularly to areas earmarked for urban regeneration such as Fishermans Bend and Arden-Macaulay, the latter only three kilometers from the city. The Victorian Government is implementing preventative planning measures to try mitigating such risks.

With respect to GHG emissions, Melbourne remains exposed to an energy sector that is still dominated by coal and has lacked the key policy signals to stimulate a low-carbon energy grid.

MOBILITY
6.7/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.5/10**

Melbourne is experiencing unprecedented levels of public transit investment, with the construction of the first underground metro line underway and another in planning as well as the removal of rail level crossings, a rail line extension to Mernda in the north and investment in new train and tram fleets. Despite the strong level of investment, the policies and plans for the integration of land use and transport are limited in Melbourne.

Plan Melbourne 2050 sets a principle around 20-minute neighbourhoods. It aims to create accessible, safe and attractive local areas where people can access most of their everyday needs within a 20-minute walk, cycle or local public transport trip.

The Victorian Government is currently developing subregional integrated transport plans that will align with the regions within Plan Melbourne; however, they were not available at the time of writing.

Melbourne has a truly multimodal public transit network, including an established train, tram and bus network that is continuing to expand to meet the sprawling growth corridors and increased densities in the inner- and middle-ring suburbs.

High-speed rail continues to be the only missing piece of the public transit network and remains under consideration.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.0/10**

A Victorian Freight Plan is currently being developed by the Victorian Government, which is expected to evaluate existing strategies and outline the government's future policy, regulatory and infrastructure initiatives.

The Port of Melbourne was leased in 2016 to a private consortium for 50 years and further capacity enhancements are planned to increase container handling by at least 1 million containers per annum at Webb Dock.

The West Gate Tunnel project is under construction and will provide an alternative river crossing to the West Gate Bridge, redirecting trucks off the bridge and providing better access to the Port of Melbourne.

An inland rail freight corridor is planned to connect Tottenham to Albury as part of the Victorian section of the corridor and will include enhancements of existing structures and increased clearances along the rail corridor.

GLOBAL CONNECTIVITY

SCORE: **9.0/10**

Access to Melbourne's global gateways via air and sea is being enhanced through planning and development of projects that will support the strong forecast growth. The curfew-free Melbourne Airport provides benefits to available capacity, which is something that is being protected to secure the future capacity of the airport.

Planning is underway for the development of a third runway at Melbourne Airport, to increase the overall capacity of the airport to meet the strong forecast growth.

Detailed planning and technical studies have begun, as well as community engagement to guide the development of the Runway Development Program. Melbourne Airport is also in the process of preparing their next five-year masterplan, which will be submitted to the Commonwealth Government by 18 December 2018.

As discussed above, capacity enhancements are also underway at the Port of Melbourne to meet the increasing demand in container handling.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.3/10**

The Victorian Cycling Strategy 2018-2028, released last year, sets out a vision for the future of cycling in the state and ways to deliver it. The construction of new shared pathways forms a key part of major road projects in Victoria but limited funding was allocated to walking/cycling projects in the 2018-19 State Budget.

Businesses are looked on to provide end-of-trip facilities, but there are no planning requirements in place. The Victorian Cycling Strategy wants to see action from city councils in amending planning provisions to place greater emphasis on these facilities being provided in new commercial/residential buildings.

The City of Melbourne has successfully trialed a pedestrian-only zone on Elizabeth Street in the city and this work is now funded. The City of Yarra is trialing low-speed zones in Fitzroy and Collingwood.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.5/10**

The City of Melbourne is investigating policy changes that would affect the provision of parking in new buildings in the central business district (CBD) and Southbank. The policy proposals would require all new buildings to have underground car parks or, where this is not achievable because of soil conditions, car parking should be constructed in a way that leaves open the option of later residential use.

There is no link between parking policy and public transport, but the City of Melbourne charges a parking levy for each off-street space within the CBD and areas of inner Melbourne, which is used to help fund road and public transport projects.

Currently there are no plans or strategies about the building code requirements related to car park design suitability for adaptive future use.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

The Victorian Government legalized Uber in 2018, imposing an AUD1 levy on all commercialized trips. It also required Uber drivers to be accredited with the Taxi Services Commission.

Victoria operates on-demand bus services, which allow bookings to be made online or via the phone. Ride-sharing services such as car-pooling have been investigated and implemented through green travel plans and the Uber pool ride-sharing service is expected to begin in Melbourne this year after being trialed in Sydney.

The City of Melbourne has an approved policy for 2,000 car-share spaces to be installed by 2021 and other inner Melbourne councils also provide car-sharing services.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **7.0/10**

Transport for Victoria has a policy on connected and automated vehicles within the state and a trial is under way on the Monash Freeway-CityLink-Tullamarine Freeway corridor through a partnership between the Victorian Government and Transurban. The first phase of the trial looked at how partially automated vehicles react to the motorway environment; the second and third phases focus on vehicles with higher levels of connectivity and automation.

The City of Melbourne has no policy on electric vehicle charging infrastructure. The Civil Aviation Safety Authority has a policy in place on the use of unmanned aerial vehicles, such as drones.

TECHNOLOGY
7.0/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Well-developed physical and digital infrastructures affect productivity directly by connecting economic agents, reducing transaction costs, easing the effects of distance and time, facilitating the flow of information, and facilitating integration of markets into global value chains. Information and communication technologies are becoming increasingly important because there is a growing empirical literature that they facilitate innovation and lift company and country productivity by giving decision-makers more complete information.

The City of Melbourne's Knowledge City Strategy and Melbourne as a Smart City outline a comprehensive community, environmental and economic strategy to design, develop and test the best ways for people to live, work and play in Melbourne.

The city sees that innovations in technology will have a role to play in creating and enhancing these experiences.

The creation of the Knowledge Strategy and a suite of initiatives including CityLab, Open Innovation Competitions, Open Data, free Wi-Fi, a 24-hour pedestrian counting system and smart bins are all indicators of the maturity of Melbourne's approach to using technology to improve their citizens' lives.

None of the benefits to citizens will be realized without scalable, secure, robust and reliable underlying technology infrastructure.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

Traditionally, internet services have been provided via copper wires initially designed to support landlines. Fiber optic cable is replacing these copper wires in most countries because it can support much higher bandwidth for multiple users than the copper wires. It's made from glass and uses light to transmit data over long distances. Fiber is essential to support both consumers and businesses as the world becomes more dependent on the ability to receive and transmit large volumes of rich media content and information.

Fiber-to-the-Home (FTTH) is superior to Fiber-to-the-Node (FTTN). The latter uses copper wires from the street to the business or home and fiber to the street only. The existence or plan to install either version of fiber is a critical element in facilitating digital connectivity.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

Each new generation of cellular technologies has brought us greater functionality available in more places with ever faster access to information. In almost all cases these improvements have been accompanied by decreasing access and usage costs resulting in mobile devices becoming an essential and ubiquitous tool for communications, content digestion and content creation. The introduction of 5G will give wireless broadband the capacity to power thousands of connected devices that will reach our homes and workplaces.

Narrowband Internet of Things (NB-IoT) is a Low Power Wide Area Network radio technology standard developed to enable a wide range of devices and services to be connected using cellular telecommunications bands. It is the backbone of the IoT. NB-IoT focuses specifically on indoor coverage, low-cost, long battery life, and enabling many connected devices. The move towards autonomous vehicles and connected infrastructure will make reliable, robust access and connectivity essential.

As more people and devices are being connected and depend on the internet, the complementary wireless technologies of 5G and NB-IoT will become redefined as part and parcel of our critical infrastructure.

The availability of Wi-Fi is essential for both personal and business applications. Many cities recognize this and provide free public Wi-Fi access both through commercial providers such as telcos and businesses as well as by the responsible authorities themselves. Regardless of who is providing the free public Wi-Fi, access and availability enables citizens and visitors to easily access a range of services at no cost.

Free Wi-Fi is provided throughout the City of Melbourne.

OPEN DATA

SCORE: **7.0/10**

Open Data relies on the idea that some data should be freely available for everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control. There is a global movement in developed countries for governments at all levels to make their vast amounts of public data freely available as open data.

Making government information available to the public as open data can facilitate government transparency, accountability and public participation. The opening of official information can also support technological innovation and economic growth by enabling third parties to develop new kinds of digital applications and services.

Open government applications seek to empower citizens, to help small businesses, or to create value in some other positive, constructive way. The City of Melbourne, Victorian Government and the Australian Government all provide open government data.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

Citizens using services, especially government services, must have confidence that any information they provide is confidential and stored appropriately, that the system they're using is safe and secure, that they know how their information will be used and that they can easily retrieve any information they provide. If a service cannot guarantee confidentiality, integrity and availability of the system, people will not use it.

The presence of strong legislative and regulatory forms of protection for data security and privacy is essential to sustain confidence and usage of online sites and information. Australia and the Victorian Government have comprehensive security and privacy legislation.

PLANNING AND POLICY

SCORE: **6.0/10**

Melbourne's documented *A Knowledge City Strategy* and *Melbourne as a Smart City* provide the overarching framework for digital initiatives. Technology is dealt with in the *A Knowledge City Strategy* and is an enabler of knowledge. The strategy does not provide a comprehensive view on technology infrastructure.

URBAN SYSTEMS
5.2/10

POWER GENERATION AND DISTRIBUTION

SCORE: **4.0/10**

Like all cities on Australia's east coast, Melbourne is hampered in its energy sector response by a policy gridlock that has dominated national politics for more than a decade. The energy grid in Victoria is predominantly fed by coal-fired power stations, with the Clean Energy Regulator rating Victoria as the third highest emitter of CO_2 by volume in Australia in 2016 to 2017. However, this is changing as the oldest and dirtiest coal-fired power stations are earmarked for closure, with the most recent being the Hazelwood Power Station in Victoria.

Policy uncertainty on climate change mitigation has led to an under-investment in new generation infrastructure to replace aging power stations. However, the consensus view is Australia will meet its Renewable Energy Target obligations of 33,000 GWh by 2020. The Victorian Government has committed the state to renewable energy generation targets of 25 per cent by 2020 and 40 per cent by 2025.

The private sector in Victoria has led innovation in the energy sector, with rooftop solar systems common and micro-grids and a smartening of the grid. This innovation is often despite, rather than incentivized by, the regulatory environment.

In 2016, the City of Melbourne released its Emissions Reduction Plan: For Our Operations. This highlights steps in efforts to reduce greenhouse gas emissions. Melbourne City Council has linked its targets to meet or exceed the minimum 1.5 degrees Celsius science-based target from the Paris Climate Change Agreement. The council has also been investing directly through its Melbourne Renewable Energy Project to buy power from a wind farm development in Victoria.

WATER TREATMENT AND DISTRIBUTION

SCORE: **6.6/10**

Melbourne's water sector consists of government-owned statutory authorities with boards appointed by the state's Water Minister. They are a bulk water and sewerage business (Melbourne Water) and three metropolitan retailers (City West Water, South East Water and Yarra Valley Water). Melbourne Water also provides waterway and drainage services across the metropolitan area and bulk water to adjacent regional businesses.



Melbourne urban water businesses are subject to regulation of drinking water (by the Department of Health and Human Services), wastewater effluent disposal standards (by the Environment Protection Authority) and pricing arrangements and customer service standards (Essential Services Commission).

Beyond the requirements of pure regulation, the Melbourne water businesses embrace the philosophy of livability, whereby they focus on the health of the community by providing safe and secure drinking water, reliable sanitation and effective flood management. To be long lasting and resilient, a water utility within a livable city must consider the needs of future generations and use systems thinking to understand and respond to shocks and long-term change while engaging with the community on projects that deliver community benefit today, aligned with their customer-focused operation and services.

The sector was hit by the Millennium Drought in the mid-to-late 2000s. Almost all Victorians faced water restrictions and some smaller towns required water carting. Major assets were subsequently constructed to provide additional water security, including the Victorian Desalination Plant (450 megalitres a day at a cost of CAD3.23 billion), the Sugarloaf Pipeline (to connect Melbourne to the Goulburn System), the Wimmera Mallee pipeline, a Melbourne to Geelong pipeline, and a pipeline between the Ballarat and Bendigo systems that accesses the Goulburn system.

Growth in urban water usage is low in most areas. Recent reductions in urban demand (particularly for non-residential use) mean that urban water use is generally lower than it was 10 years ago. However, with projected climate change and a doubling in Melbourne's population by 2065, projections are that an increase in consumption might result in the city starting to run out of water within a decade. To combat this possibility, the Melbourne water businesses are investing in obtaining more water from alternative supplies such as recycled water and treated stormwater and ground water.

WASTE MANAGEMENT

SCORE: **5.1/10**

Waste management in Melbourne is operated by the Metropolitan Waste and Resource Recovery Group (MWRRG). It brings together the waste strategy and initiative goals of the 31 metropolitan councils. Working with other state departments, MWRRG has developed a plan that provides a roadmap to shape Melbourne's network of waste and resource recovery infrastructure for the next 30 years. Like many other major cities, Melbourne is seeking to educate its population about waste to change perceptions and capitalize on a readily available resource. As part of this initiative an education strategy has been developed to supplement the Metropolitan Implementation Plan (MIP) to support the community and business.

It is acknowledged within the MIP that landfill continues to be an acceptable waste disposal mechanism for certain waste types. Biodegradable waste is not acceptable for landfill and some strategic initiatives have been developed that target the removal of biodegradable products, such as food, from the waste stream.

Many of Melbourne's landfills are aging with 13 expected to close during the next 10 years and a total of 16 during the next 30 years. This leaves four significant landfills to meet Melbourne's needs in the long term. These landfills can accept putrescible waste with one also licensed to accept prescribed industrial waste.

These landfills are of state importance and critical waste infrastructure for the entire metropolitan Melbourne region. Closure of any of these major landfills would result in insufficient landfill supply and would require new replacement facilities to be established. At this stage, additional landfill construction is not anticipated and MWRRG is looking towards improved waste management technology to cover potential shortfalls.

Considerable effort and financial commitment is being made to maintain Melbourne's livability status with a focus on achieving maximum resource recovery for the growing population. Linking the state Infrastructure Development Plan, Metropolitan Planning Strategy (Plan Melbourne 2017 to 2050), the MIP and the subsequent role out of supporting guidance such as the Guide to Best Practice for Waste Management in Multi-unit Developments (revised March 2017) via Sustainability Victoria has added to a coordinated and cohesive plan for future waste planning in Melbourne.



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15

Home to white beaches, broad forests and the shiny urban towers immortalized in the film* The Matrix, *Sydney wears its global icons proudly: the Harbor Bridge spanning the world's greatest harbor and the Opera House, on its southern shore.

AT A GLANCE

RANKED **15**
CITY SCORE: **25.42**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.8/10	**6.7/10**	**7.5/10**	**4.5/10**

The city is an economic hub of Australia and has ridden the wave of 25-plus years of uninterrupted economic growth.

Sydney is a city with a big footprint, its western corridors to the north and south of the Parramatta River absorbing a burgeoning population, with growth rates among the highest in the OECD.

Greater Sydney is made up of 33 local councils. The state of New South Wales has jurisdiction over transport, planning, health and education, but, without an integrated framework for planning and investing in the greater metro area.

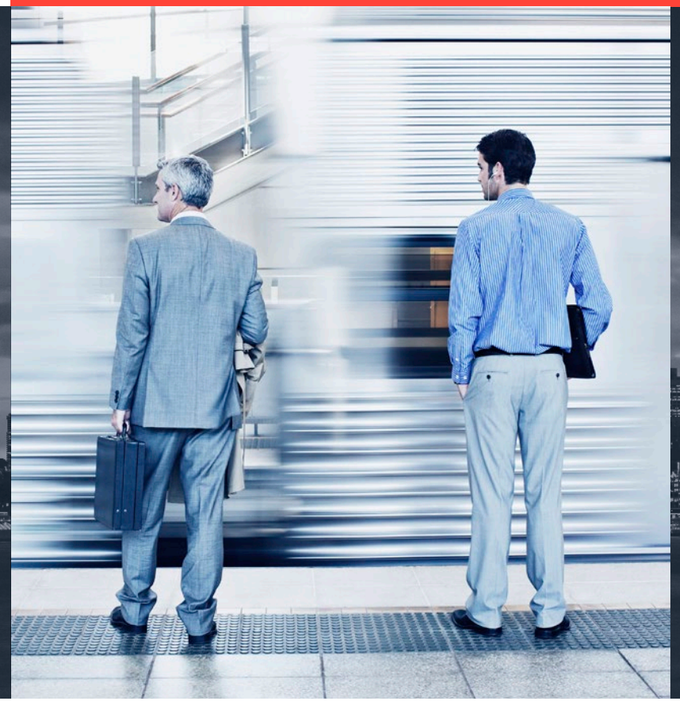
The Greater Sydney Commission was established in 2016 to integrate land use and infrastructure planning for the city.

Already a region beset by bushfire and flood, Sydney also faces severe climate-related risks, most notably with heat waves. Coastal property is at risk of sea-level rises and the city's growth will put its natural resources such as fresh water under pressure in coming decades.

In 2018, Sydney is in the midst of an unprecedented infrastructure boom of metro lines, light rail, highways, schools and hospitals. It has a renewed focus on housing and affordability, and a mandate to invest in the west.

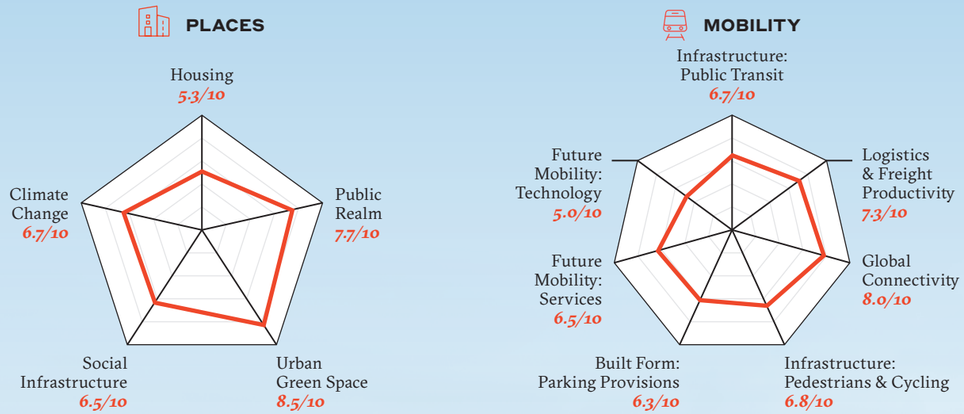
The future of Sydney is bright as the population swells to over eight million people by 2050.

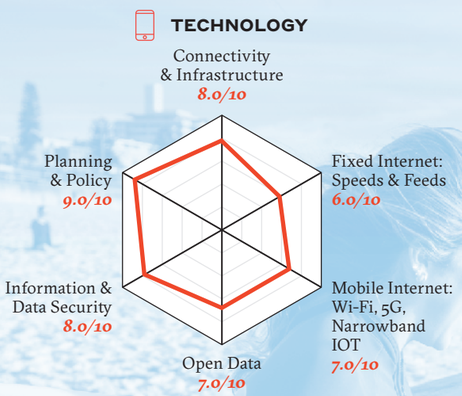


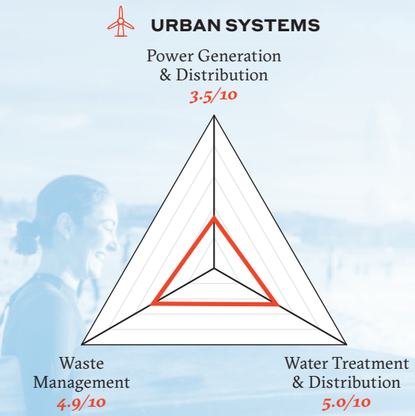




CITY ASSESSMENT







PLACES
6.9/10

HOUSING

SCORE: **5.3/10**

Sydney's planning invariably makes mention of affordable and accessible housing, calling for affordable rental housing targets, and such housing is a clear objective of the A Metropolis of Three Cities – The Greater Sydney Regional Plan. It sets an affordable housing target of five to 10 per cent of new dwellings, subject to viability, but these targets are not fixed in the subsidiary plans developed by regions and Local Government Areas (LGAs) (Council Local Environmental Plans). The responsibility for implementing housing affordability is devolved to councils that have not addressed the issue so far.

The city has set housing targets by region to meet and balance the projected demand but as with affordability targets, they rely on implementation by LGAs in Local Environment Plans, which has not been forthcoming. Sydney's proliferation of LGAs is a structural barrier to delivering the housing needed for effective growth.

The planning framework makes provision for compact development in urban renewal precincts aligned with new transit infrastructure and broader priority precincts for medium- or high-density development. Design guidelines have been issued for medium-density infill development.

In support of amenity in the transition to a more compact city, Sydney has the Apartment Design Guide (ADG), which provides controls on natural ventilation, solar access and design review requirements. It also has the Building Sustainability Index (BASIX) framework, which requires minimum thermal comfort, energy and water performance for all new dwellings. Both the ADG and BASIX are embedded in the regulatory approval framework for new dwellings.

PUBLIC REALM

SCORE: **7.7/10**

Sydney's ocean-side and harbor public realm are world-renowned and receive the bulk of attention and global interest, possibly to the detriment of its urban realm.

Streets are the most common public places in most cities. Their importance is reflected in both the land use planning and transport planning for the city — the Movement and Place Framework. District plans make allowances for the flexible use of streets for community activities and the importance of streets supporting healthy and active lifestyles, specifically mapping street life and meeting places, including live music, farmers' markets, high streets and eat streets.

The importance of public places is clearly identified in the city plans — diverse places from streets to squares to rooftops and beaches, community gardens, farmers' markets, co-working spaces, music venues and playgrounds.

The responsibility for delivery of the plans is devolved to LGAs and the mechanisms for implementation are not spelt out.

The planning for Sydney's waterfronts is stronger than for its urban places. Specific planning documents include the South Creek Corridor Plan in the west and planning priority for delivering high-quality, open space in the east.

URBAN GREEN SPACE

SCORE: **8.5/10**

Planning for Sydney highlights *A City in its Landscape* as a primary goal and developing a city of extensive and connected green space is central to the city planning agenda. The green infrastructure plan for Sydney considers waterways, parks and open spaces, urban tree canopy and ground cover and urban bushland.

The metropolitan plan is supported by other government initiatives, including a metropolitan water management plan, biodiversity investment opportunity mapping and New South Wales (NSW) Guidelines for Urban Green Cover to support canopy cover across the city.

The NSW Government Architect's office has developed a Green Grid strategy for metropolitan Sydney that includes a spatial framework for project opportunities.

SOCIAL INFRASTRUCTURE

SCORE: **6.5/10**

Services and infrastructure that meet communities' changing needs are high-profile objectives of the Greater Sydney Regional Plan, although the detail of health, education, and investment is to be found in agency planning frameworks. The NSW School Assets Strategic Plan provides a needs-based assessment of the projected primary and secondary students to 2030.

Expanded childcare and schooling are dealt with in the regulatory planning framework as well as the strategic planning framework, the State Environmental Planning Policy (Educational Establishments and Child Care Facilities).

Sydney has four world-recognized universities and each is expanding in partnership with government and industry in planned innovation precincts for Health and Aerospace aligned with strategic public investment in new infrastructure. The importance of high-value cultural institutions is identified in the plans but the specific long-term investment planning is less obvious.

Imbalances in the investment patterns for cultural infrastructure between the established eastern city and the growing western city remain a challenge for Sydney.

CLIMATE CHANGE

SCORE: **6.7/10**

Sydney has elevated risks to climate change and strong institutional capacity to respond to those risks.

The NSW Climate Change Policy Framework identifies the importance of both adaptation and the removal of GHG emissions from the state economy, with a target of net zero GHG emissions by 2050. The adoption of the Rockefeller 100 Resilient Cities program has raised the awareness level of systemic resilience issues across the city.

The city also has elevated risk of extreme heat waves in the west, where most future residents will live. The land-use policies of urban greening to alleviate heat stress will become increasingly important. Sea level and coastal inundation risks also pose long-term climate challenges to the harbor city.

Sydney's energy sector is still dominated by coal and the city lacks the key policy signals to stimulate a low-carbon energy grid. Similarly, a clear plan to transition the transport sector to electricity, hydrogen and another low-emissions alternative is yet to be seen.

MOBILITY
6.7/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.7/10**

Australian cities have long delivered a world-leading mix of amenity, livability and prosperity, making them a global destination of choice for immigration.

Robust growth in Sydney's population is projected to continue, with most new residents living west of Parramatta, in a region expected to experience some of the more intense climate change impacts through heat stress.

The Greater Sydney Commission has taken a long-term view of metropolitan planning aligned with infrastructure planning to enable this growth effectively, and to the benefit of all Sydney's communities. The draft regional plan for Greater Sydney has been concurrently developed with the metropolitan transport plan, Future Transport 2056, and the State Infrastructure Strategy, meaning better connections for people in Greater Sydney.

Several strategic planning documents for Sydney's future integrated transport have been developed by state agencies and the Greater Sydney Commission.

Greater Sydney's many local councils have also developed strategic plans for their jurisdictions that are aligned with broader infrastructure planning. Examples from significant councils such as the City of Sydney and the City of Parramatta were also considered in this assessment.

Sydney is awash with transport infrastructure work:

- New metro lines under construction to the north-west and the city center, with southern extensions in planning
- Motorway resilience and capacity projects in construction including improved connectivity to sea and airports
- Construction and planning of multimodal logistics hubs
- Light rail and high capacity bus networks in implementation
- Funding and planning approval for a second international airport.

The Greater Sydney Commission's Towards our Greater Sydney 2056 plan was developed along with the metropolitan transport plan, Future Transport 2056, and the State Infrastructure Strategy.

There is a depth of transport choice and plans for continued improvement to connectivity. The only missing piece is high-speed rail and its suitability is still being considered.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.3/10**

Sydney established a high-performance motorway orbital (Westlink M7) in 2005 bypassing the central business district. It continues to develop plans for an outer orbital (M9) motorway.

An inland rail freight corridor is in prospect to take loads away from the heavily populated coast while introducing multimodal interchanges.

The City Deal identifies two future multimodal interchanges within the Western Sydney plan.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

In terms of global gateways, Sydney has documented plans for responding to air and sea connections.

The international air gateway to Sydney (Kingsford Smith) will be expanded by the construction of the Western Sydney Airport, due for first-phase operation in 2026.

Sydney is primarily served by the ports of Botany, Kembla and Newcastle. They are forecast to approach capacity outside the timeframe of this study (mid-2030s to mid-2040s).

Projects are planned to support improved connectivity and integrated performance for supporting rail and road infrastructure.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.8/10**

Councils and state agencies develop and implement the shared path projects intra- and inter-local government jurisdiction. City of Sydney has plans for more than 200 kilometers of dedicated cycleway network.

Pedestrian and low-speed zones are common and continue to increase across Sydney, recognized in council pedestrian strategies and achieving a safer vehicle/pedestrian/cycle interface.

There is no overarching strategy for end-of-trip facilities to support increases in active transport but these features continue to represent value in the commercial decisions made in selecting commercial and residential space.

BUILT FORM: PARKING PROVISIONS

SCORE: **6.3/10**

Sydney recognizes the change in behavior of residents in reducing reliance on personal vehicles. In response, its Sustainable Sydney 2030 Strategy considers this reduced demand and the ability to transition on-street parking to other uses including shared-vehicle-only parking.

There is discussion of building code requirements related to car park design suitability for adaptive future use.

Although there is acknowledgement of behavioral change in planning documents, firm strategies and commitments to progress are generally of smaller scale.

FUTURE MOBILITY: SERVICES

SCORE: **6.5/10**

Sydney and NSW have reacted to on-demand services in much the same way as other places. The nature of these mobility services is such that public funding or investment in infrastructure has not been needed to support the implementation, and the rapidly evolving nature of the market has not allowed for much future planning with confidence.

The activity undertaken in Sydney has been to clear the regulatory and legislative obstacles to the efficient delivery of these on-demand services. Authorities say 50 legislative and regulatory amendments have been enacted to smooth the transition in transport.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

Both the Future Transport Plan and the Greater Sydney Regional Plan note the potential of automated/driverless vehicles, electric vehicles and drones (primarily in relation to last-mile freight but acknowledging the future may include passenger transport). These future technologies are generally seen as suitable for "further investigation" without firm strategy or implementation.

The City of Sydney has installed electric charging points in public car parks. An automated vehicle trial is under way around Sydney Olympic Park.

TECHNOLOGY
7.5/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Well-developed physical and digital infrastructure affect productivity directly by connecting economic agents, reducing transaction costs, easing the effects of distance and time, facilitating the flow of information, and facilitating integration of markets into global value chains. Information and Communication Technologies (ICT) are becoming increasingly important; there is a growing sense that they facilitate innovation and lift company and country productivity by giving decision-makers more complete information.

The City of Sydney's Digital Strategy outlines a way to find which services and programs should be delivered digitally in the future and which should remain available offline. The creation and publication of this comprehensive document alone is an important indicator of the maturity of Sydney's approach to using technology for the betterment of its citizens' lives.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

Traditionally wired internet services have been provided via copper wires designed to support landlines. Fiber optic cable is replacing these copper wires in most countries. Fiber is a fixed-line internet that can support much higher bandwidth for multiple users than the copper wires. It's made from glass and uses light to transmit data over long distances. It is far superior to copper wire and is essential to support both consumers and businesses as we become more dependent on our ability to receive and transmit large volumes of rich media content and information.

Fiber-to-the-Home (FTTH) is superior to Fiber-to-the-Node (FTTN). The latter uses copper wires from the street to the business or home and fiber to the street only. The existence or plan to install either version of fiber is a critical element in facilitating digital connectivity.

Under the Australian National Broadband Network, Sydney and Australia are predominantly receiving FTTH.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

Each new generation of cellular technologies has brought greater functionality available in more places with ever faster access to information. In almost all cases these improvements have been accompanied by decreasing access and usage costs resulting in mobile devices becoming an essential and ubiquitous tool for communications, content digestion and content creation. 5G will give wireless broadband the capacity it needs to power thousands of connected devices that will reach our homes and workplaces.

Narrowband Internet of Things (NB-IoT) is a Low Power Wide Area Network (LPWAN) radio technology standard developed to enable a wide range of devices and services to be connected using cellular telecommunications bands. It is the backbone of the IoT. NB-IoT focuses specifically on indoor coverage, low-cost, long battery life, and enabling many connected devices. The move towards autonomous vehicles and connected infrastructure will make reliable robust access and connectivity essential.

As more people and devices are being connected and depend on the internet the complementary wireless technologies of 5G and NB-IoT will become redefined as part and parcel of our critical infrastructure.

The availability of Wi-Fi is considered essential for both personal and business applications. Many cities recognize this and provide free public Wi-Fi access both through commercial providers, such as telcos, and businesses, such as cafes, as well as by the responsible authority itself. Regardless of who is providing the free public Wi-Fi, access and availability enables citizens and visitors to easily access a range of services at no cost.

Sydney has many commercial providers of free Wi-Fi and plans to increase access.

OPEN DATA

SCORE: **7.0/10**

Open Data is the idea that some data should be freely available to everyone to use and republish, without restrictions from copyright, patents or other mechanisms of control. There is a global movement in developed countries for governments at all levels to make their vast amounts of public data freely available.

Making government information available to the public as Open Data can facilitate government transparency, accountability and public participation. Opening up official information can also support technological innovation and economic growth by enabling third parties to develop new kinds of digital applications and services.

Open government applications seek to empower citizens, to help small businesses or to create value in some other constructive way. The City of Sydney, New South Wales Government and the Australian Government all provide open government data.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

Citizens using services, especially government ones, must have confidence that any information they provide is confidential and stored appropriately, that the system they're using is safe and secure, that they know how their information will be used and that they can easily retrieve any information they provide. If a service cannot guarantee confidentiality, integrity and availability of the system, people will not use it.

The presence of strong legislative and regulatory forms of protection for data security and privacy is essential to sustain confidence and usage of online sites and information. Australia and the New South Wales Government have comprehensive security and privacy legislation.

PLANNING AND POLICY

SCORE: **9.0/10**

Sydney's Digital Strategy provides the overarching framework for digital transformation, guiding the approach that will be taken and articulating the things that need to be considered and achieved to be successful. The document recognizes the necessity of having robust, reliable, secure infrastructure and connectivity to ensure that the vision for a Digital City of Sydney is possible.

The presence of this strategy together with the political support evident in producing and implementing it is a positive indicator of future readiness.

URBAN SYSTEMS
4.5/10

POWER GENERATION AND DISTRIBUTION

SCORE: **3.5/10**

Like all cities on Australia's east coast, Sydney is hampered by the energy policy gridlock that has dominated Australian politics at a federal level for more than a decade. The energy grid in NSW is predominantly fed by coal-fired power stations, with the Clean Energy Regulator placing the state as the second highest emitter of CO_2 in Australia in 2016 to 2017.

Policy uncertainty on climate change mitigation has led to an under-investment in new generation infrastructure to replace aging power stations. This is changing as belief strengthens that Australia will strive to meet its Renewable Energy Target obligations of 33,000 GWh by 2020.

The private sector in NSW has led innovation in the energy sector, with rooftop solar systems common and micro-grids and a slow smartening of the grid. This innovation is often despite, rather than because of, the regulatory environment. Unlike Victoria and Queensland, there is no explicit state renewable energy target for NSW.

About two-and-a-half years ago the City of Sydney completed a major study and report, the Energy Efficiency Master Plan: Improving Energy Productivity. This highlights important steps to reduce GHG emissions but is not necessarily linked to external comparable benchmarks. There is room for improvement for Sydney to decarbonize its energy systems and encourage a smart grid that can manage demand, include high proportions of renewable energy, and maintain reliability.

WATER TREATMENT AND DISTRIBUTION

SCORE: **5.0/10**

Sydney Water, the government-owned statutory corporation providing potable drinking water and wastewater and some stormwater services to the Sydney metropolitan and surrounding areas, is embarking on a Lifestream Strategy of becoming a highly efficient, world-class utility. It delivers 551 billion liters of water annually, serving about five million people across Sydney in two million properties.

Beyond the implementation of its customer-centric design, Sydney Water is investing in transforming the way it does business, prioritizing customer experience and enhancing efficiencies by working with its supply chain to serve customers better and reduce complexity.

As with other parts of Australia, Sydney faced a chronic water management challenge because of its fast population growth, long-term climate change exposure and water shortages that date back to the early 2000s drought.

This challenge led to a substantial public investment in resilience infrastructure including a desalination plant and water recycling precincts across the city. There has also been a boom in private water schemes due to recent legislative changes, including water recycling plants at Gerringong and St Mary's. The CAD60 billion Barangaroo development and the Sydney Olympic Park Authority water reclamation and management scheme are some of the larger private schemes. These plants have supported new compact development across the city, enabled by the regulatory framework for competition in the water sector. However, these systems are limited in their reach. It isn't clear that Sydney has the breadth of resilience features to avoid severe water constraints in a climate-uncertain future.

Although river discharge water quality is strictly regulated, Sydney's deep-water, ocean-outfall system for wastewater is not world's best practice, but recent capital investments has greatly improved the public health problems at Sydney's beaches. Newer treatment plant upgrades indicate an increasing planning focus on better treatment technology and better environmental and public health outcomes than in the past, such as the Lower South Creek Treatment Program.

Warragamba Dam is the biggest concrete dam in Australia and one of the largest domestic water supply dams in the world. Lake Burragorang, which is formed behind Warragamba Dam, is about four times the size of Sydney Harbor. In 1998 the Sydney Catchment Authority was created and is firmly focused on security of raw water sources.

WASTE MANAGEMENT

SCORE: **4.9/10**

Waste management in Sydney is the responsibility of local governments. As Sydney is made up of many local government areas it was recognized that to attain world-class status in waste management efficiencies, particularly in relation to waste infrastructure, planning would be needed.

In response, a series of alliances have been created specifically to facilitate strategic waste management planning. This has enabled Sydney to be defined as four distinct waste management areas, namely Northern Sydney Regional Organization of Councils (ROC), Western Sydney ROC, Southern Sydney ROC and the City of Sydney (CoS).

Strategic plans for waste minimization and resource recovery exist for all ROCs to 2021 (except Western Sydney) and CoS to 2030. The plans (particularly the CoS) lean heavily on funding generated via the NSW waste levy (CAD60 million to 2020) to achieve strategic goals of changing the nature of waste management by shifting the focus from waste to resource recovery. Funding is likely to decline as new infrastructure is established with maintenance becoming the focus as opposed to innovation.

The aim of a zero waste Sydney is dominant for CoS. International case studies have been considered in the derivation of strategic targets and these include infrastructure planning (collection and management), education, population densification, technology requirements and resource recovery markets.

Landfills are also well regulated and typically well managed. Residential waste is separated and commercial waste in the built environment has high levels of diversion from landfill supported by the green building sector. NSW Environment Protection Authority (EPA) notes that there is a diminishing supply of approved landfill capacity particularly within greater Sydney and while zero waste to landfill is a strategic target it is unlikely to be achieved in the near term. Other technologies such as waste to energy plants are being investigated.

Efforts to mitigate waste in the supply chain are part of the strategy with actions, including recycled products, starting immediately for council projects and operations. Single-use plastics are common and Sydney suffers from the same highly wasteful goods packaging economy as many other rich cities.

Hazardous wastes remain the responsibility of the NSW EPA and are governed separately to the other domestic or commercial waste streams. The NSW Protection of the Environment (Waste) Regulation 2014 has no hazardous waste reduction targets and focuses solely on environmental protection and handling of hazardous wastes.

Sydney does everyday waste management well and is learning lessons from other more established major cities' waste management practices. Some funded initiatives are gaining traction and consideration of city expansion and densification plays a key role in strategy. The realization of a zero waste Sydney and achieving a low-waste trajectory is under way and supported by the collaborative approach adopted by the ROCs and CoS.

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16

DUBAI



Founded as a fishing and pearl-diving village in the eighteenth century, Dubai has emerged as a thriving business and financial metropolis, known for its luxury shopping and awe-inspiring, ultra-modern architecture.

Located on the fringe of the Arabian Desert, Dubai is both a city and an emirate in the United Arab Emirates (UAE) on the southeast coast of the Persian Gulf. Sitting at the crossroads of Asia, Africa and Europe, the city boasts many world firsts. It has the world's busiest airport, the largest man-made harbor (Port of Jebel Ali) and the tallest skyscraper — the Burj Khalifa — that dominates the skyline and reclaimed islands including the Palm Jumeirah.

Dubai is now the most populous city in the Gulf region with strong employment figures and a rising per capita income. As oil makes up only 6 per cent of its revenue, Dubai has fared relatively better than its neighbours as oil prices have declined in recent times. The city's economic strength is attributed in part to the government's decision to diversify its trade economy. From the late 1960s, the city used oil revenue to create infrastructure and the population expanded rapidly as foreigners flooded in to work on construction projects. Today, tourism, financial services, construction and real estate are the biggest contributors to the economy.

The government has created industry-specific free zones throughout the city. The Jebel Ali Free Zone hosts 7,100 companies. The Dubai International Finance Center is the largest financial services center between Singapore and Europe and the Silicon Oasis hosts some of the world's major IT companies.

Dubai is an absolute monarchy and has been ruled by the Al Maktoum family since 1833. The city has a big globalized workforce and a large proportion of the resident population are expatriates hailing predominantly from India, Pakistan, the Philippines, Bangladesh and Sri Lanka. While religion plays a significant role in the society's fabric and there are freedom of speech and gender role constraints, efforts are being made to build a more socially inclusive city with the 2016 appointment of a Minister of State for Tolerance.

In 2013, Dubai won the rights to host Expo 2020. With it came a push for sustainability and place parameters on its urban expansion (The Dubai Plan 2021). The city aims to provide seven per cent of its energy through renewable sources by 2020 with increased targets to 2050 (Clean Energy Strategy).

The government has invested in improving the reliability of its public transport network, though few use it. Cheaper cars, subsidized fuel prices and lower maintenance costs reinforce people's preference for cars as a mode of transport. However, the city's Green Mobility Initiative aims to reduce carbon emissions and includes targets like converting half the taxi fleet to hybrid by 2021.

Rapid urbanization, population growth and the effects of climate change are key issues for the UAE Government.

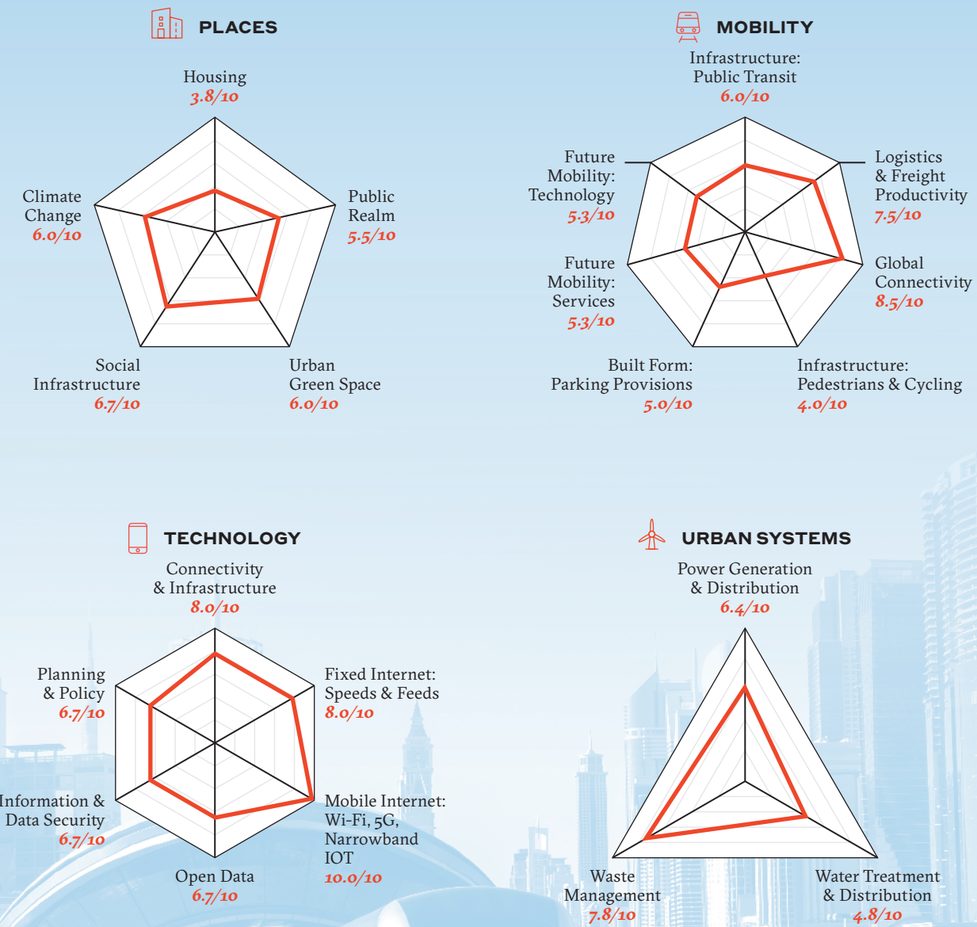
If Dubai continues to strive for sustainability with the same aplomb as free trade, real estate and tourism, the city will no doubt make the successful transition to a green economy hub.

AT A GLANCE

RANKED **16**
CITY SCORE **25.40**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
5.6/10	**5.8/10**	**7.7/10**	**6.3/10**

CITY ASSESSMENT



PLACES
5.6/10

HOUSING

SCORE: **3.8/10**

From the late 1970s, housing development was driven by oil and trade. It was typically mid-rise apartments for the transient expat communities and villas for the Emirati nationals. It wasn't until the late 1990s, when Dubai changed its economic model from reliance on oil to become a center for tourism and business that the development of housing took off.

The Greens, Arabian Ranches, The Meadows, The Springs and Emirates Hills were among the first of the new developments to be built in the wake of Dubai's boom. They set the pattern to come, which ranged from the mid-rise high-density of The Greens, through the mid-size and large villas of The Springs and The Meadows, to the exuberant Emirates Hills that might well have been an extension of California's Beverly Hills.

Housing has also expanded vertically with 18 per cent of all tall buildings in the world located in Dubai, many of them totally residential. Highly-paid expatriates and Emirati nationals were the target clientele. Dubai's latest housing developments have continued in the same vein, with a few exceptions, but even those exceptions still have a target audience of medium earners.

Properties for the rich such as Dubai Hills and Dubai Creek Harbor continue to be developed but a void has been left for affordable housing units. These are for people with salaries ranging from CAD1,060 to CAD3,540 a month, according to the Dubai Municipality. The provision of affordable housing has been a hot topic in the media. The Dubai 2020 Masterplan does not define when and how the city will develop or the percentages of housing types required.

Dubai's response to the lack of affordable housing was the adoption of a policy last year that classifies low-income people according to nationality, family type and needs. Little is known about the policy and affordability of low-cost housing.

PUBLIC REALM

SCORE: **5.5/10**

Dubai's streets fall into three categories: main transit routes for commuters and other traffic, residential streets in quiet suburban communities and bustling night-time shopping streets for eats and treats. They all showcase a history of the development of Dubai from the late nineteenth century Bastakiya Quarter to the ultra-modern downtown Dubai.

The two authorities in Dubai governing the public realm are the Roads and Transport Authority (RTA) and Dubai Municipality (DM). The RTA is the custodian of the Right-of-Way (ROW) and has established a protocol for arrangement of traffic lanes, on-street parking and utility services within each ROW. DM is the custodian of the public realm within the ROW and sets the minimum requirements for planting, street furniture and finishes. Because both organizations are public authorities with budget constraints, publicly funded streets have much the same look and feel all over the city unless they are part of an iconic development. Minor changes to the protocols are always being considered but there is no plan to overhaul them.

Companies such as Emaar, Meraas and Dubai Properties use the same protocols in building streets in their developments but have much larger budgets and need each project to look different from the last.

Squares and piazzas in Dubai are relatively few but developers are starting to integrate them into their projects as areas for people to walk, gather and enjoy the surroundings.

Dubai's coastline has increased five-fold in the past 30 years from about 60 kilometers measured from the Abu Dhabi border to the Sharjah border to more than 300 kilometers with the development of the Palm Jebel Ali, Palm Jumeriah and World Islands, to name a few. The latest increase was added only two years ago with the dredging of an inland channel that joined the natural Dubai Creek to the Arabian Gulf creating an inland island. These developments and others, including the 75 kilometer Arabian Canal, are all part of the Dubai 2020 Urban Masterplan.

Not all of Dubai's natural beachfronts are open to the public. Some belong to the many royal palaces or are the province of hotels; others belong to private villas. Dubai Municipality's planning strategy for natural public beaches has been slow to incorporate boardwalks, amenities and cafes. Only one undeveloped beach accessible to the public remains.

URBAN GREEN SPACE

SCORE: **6.0/10**

In a desert country such as the Emirate, where temperatures can reach 50 degrees Celsius, green space is important. The current requirement is a minimum of 13.5 square meters of green space for every inhabitant. Under the ever-evolving Dubai Urban Masterplan this could be raised to 25 square meters in the next few years.

Land and property developers have also been key to the recent development of green spaces with the vast majority of projects encouraging walkability and incorporating green spines for residents to enjoy and attend social events.

DM and RTA have an ongoing initiative as part of the Dubai Urban Masterplan to landscape the city's main road infrastructure by providing a mixture of grass coverage and automatic irrigation systems.

Treated sewage effluent is recycled and used as the source of water for all public green areas. This standard approach by DM has proved vital in the growth and development of the city's green areas.

SOCIAL INFRASTRUCTURE

SCORE: **6.7/10**

The healthcare system has both government and private facilities to cover all eventualities. In 2016, the five-year Dubai Health Strategy was developed to transform Dubai into a leading healthcare provider.

Dubai has become a healthcare tourism destination, and intends to capitalize on this success through the Dubai Health Strategy. This is only one aspect of a 15-point strategy that also focuses on preventative medicine and chronic disease management.

As with healthcare, education is provided by government and private establishments. But the difference is that government schools can only be attended by Emirati nationals. There is no established curriculum or educational standards outside of the government system.

Private schools in Dubai base their curriculum on their students' countries of origin or on whatever best business case they generate. The Knowledge and Human Development Authority is responsible for the growth and quality of private education in Dubai. It supports and monitors schools, universities, parents, students, educators, investors and government partners with the aim of creating a high-quality education sector focused on happiness and wellbeing.

The Dubai Culture and Arts Authority (Dubai Culture) has a critical role in achieving the vision of the Dubai Strategic Plan 2021 to establishing the city as vibrant, global Arabian metropolis that shapes culture and arts in the region and the world.

CLIMATE CHANGE

SCORE: **6.0/10**

As a result of climate change, the direct effects of extreme weather conditions are likely to hit Dubai hard. It is planning to cope with rising sea levels, flooding and increased rainfall in several ways. Reforestation projects are under way and there will need to be big modifications to existing infrastructure.

With plans to mitigate the effects of climate change, projects such as mega solar farms and electric vehicles have been initiated in the city.

Dubai planning standards (including the green building requirements) also incorporate futuristic requirements and consideration of the environment and climate change impacts.

At a federal level, the UAE has commissioned studies into the challenges it faces from climate change. Some of the areas it is focusing on include reduced reliance on fossil fuels through the construction of the UAE's first nuclear power station, reduction in water consumption because of the power used by desalination plants in treating it, and increased public transport.

MOBILITY
5.9/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.0/10**

The RTA has prepared an update of the Transport Masterplan that lists projects to be completed between 2020 and 2030 covering road, rail, buses and marine, including travel demand management measures.

Projects such as the Metro system, feeder buses, upgrade of strategic corridors and the development of integrated mobility platforms are identified in the master plan and funded accordingly. The key objectives are:

1. Increasing public transport use by 30 per cent by 2030
2. Lengthening the public bus network to about 4,300 km in 2020, then to 5,400 km in 2030
3. Increasing the marine transport network to be 60 km with 22 terminals.

The Urban Planning Masterplan to 2020 has been designed to cater for city growth following principles such as integration and sustainability. This includes the optimization of existing transport infrastructure while keeping a balance against land uses with an emphasis on public transport.

Dubai has followed the 2020 Urban Planning and 2030 Traffic and Transport Masterplans in developing several modes of transport and paying attention to interchange and multimodal travel. The modes include the Dubai Metro (extension being designed), taxis, buses, water taxis, feeder buses and tram systems. Bus Rapid Transit and demand-responsive systems are being studied.

A passenger and cargo network connecting the six Gulf Cooperation Council countries — Saudi Arabia, Kuwait, the UAE, Qatar, Bahrain, and Oman — has been pushed back to 2021 in the aftermath of the oil price plunge. The UAE suspended construction of its portion of the network in 2016. The 1,200-kilometer railway network project is now being built in stages to link the principal centers of population and industry of the UAE.

Dubai is also considering the rail Hyperloop as an ultra-high-speed connection with Abu Dhabi.

The RTA and the Smart Dubai Office have agreed to extend the existing electronic ticketing system and its NOL card as a means of payment for services across Dubai. A smart ticketing system that will check passengers in and out using smartphones is also being developed by the RTA.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.5/10**

Dubai has established itself as a global logistics hub, acting as a gateway between Europe and the Far East. The Jebel Ali Port and associated free zone is capable of handling about 15 million twenty-foot equivalent units (containers) a year. The introduction of free zones has also facilitated market growth by easing the regulatory standards as well as the fiscal pressure, attracting companies and investors as a result.

GLOBAL CONNECTIVITY

SCORE: **8.5/10**

Dubai is generally recognized as a hub for both air and sea travel. Dubai International consistently tops the list of the best airports in the world for flight connections (serving 140 airlines and 270 destinations), passengers and facilities.

The Dubai Airports Strategic Plan 2020 aims to increase annual international traffic from 60 to 90 million passengers by the end of this year for Dubai International alone. At present, it is upgrading Terminal 2 to expand its capacity to 10 million passengers a year while Dubai Al Maktoum has been experiencing a steady growth in the past five years. Similarly, the port has state-of-the-art facilities and is the logistics hub of the region.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **4.0/10**

Active transport modes have been prioritized in the past few years. Pedestrian planning is more developed than cycle planning. Dubai has the most advanced regulations and planning for these two modes in the Gulf. Attention has been given to pedestrian safety and comfort with more areas equipped with shelters, air-conditioned facilities, raised paths for crossing roads and low-speed zones with pedestrian priority.

Planning regulations from the RTA, such as those for Dubai Pedways, address maximum walking distances, pedestrian desire lines and shading, among others. Plans are also in place to increase the provision of bike lanes, ensuring safety standards and minimizing cycle and vehicle accidents. Much work has been done to develop cycling lanes, which now cover 316 kilometers. A total of 850 kilometers is planned by 2030.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.0/10**

Because of a dramatic increase in the population and in the number of private vehicles in recent years, Dubai has been the first in the Gulf to implement best practice guidelines that discourage the use of private cars while providing public transportation alternatives. The use of private vehicles and traffic congestion remains today. The government has a strategy in place, together with an adequate regulatory framework, to tackle these problems.

The RTA has plans to regulate parking in the city by promoting increased parking rotation, shared parking and metered parking. Based on an updated zoning strategy, RTA issues permits for resident parking, paid parking in controlled areas and parking for the disabled and elderly depending on zone types (commercial zones, non-commercial zones and special areas). In addition, the government has increased the number of park-and-ride sites to promote interchange and the use of public transport as well as introducing car-pooling initiatives.

FUTURE MOBILITY: SERVICES

SCORE: **5.3/10**

The RTA has implemented shared mobility services via several different platforms, some of which are still at the testing stage. The market does not seem to be mature enough when compared with those in Europe and North America. Uber, Careem and similar services could benefit from fully developed platforms although usage is relatively low.

As part of the Traffic and Transport Masterplan 2020, the RTA has developed an Integrated Mobility Platform (S'Hail) that will bring together the entire Dubai public transport offerings in a single smart App. Dubai has completed the tests of the two-seater autonomous air taxi, which will take customers from origin to destination without human intervention.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.3/10**

Dubai has given much attention to advanced transport technologies. The RTA is developing plans for driverless trams, autonomous express buses and taxis, electrical vehicles and autonomous aerial vehicles.

The Government of Dubai has a Smart Mobility Strategy intended to tackle the resilience of private vehicle-dominated transport and the challenges of laws and regulations for driverless vehicles. It acknowledges the need for flexibility in changing or upgrading legislation to accommodate new technologies. The initial target is that 23 per cent of all journeys will be driverless by 2030.

TECHNOLOGY
7.7/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Dubai sees itself as a pioneering city that aims to be at the forefront of all things big and new. Technology is no exception. Although Dubai and the UAE do not offer the diversity of multiple service providers to choose from, their infrastructure and connectivity stands up to global comparison. Ninety-three per cent of homes can access high-speed internet via fiber.

Dubai continues to invest in its connectivity infrastructure. Its goals are set high. Last year alone, it spent CAD1.8 billion. In most cases, fixed internet is still limited to two national service providers, Etisalat or Du, depending on which one is available in a given area. Because of the lack of competition, the cost of service remains comparatively high. At present, it is not clear if the telecommunications authority plans to allow more service providers in the country.

Popular free-to-use video-conferencing services such as Skype, Facetime and WhatsApp calls are blocked at the service provider level, which is an emotive subject with consumers.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

Network infrastructure in the UAE and Dubai is among the most advanced in the Middle East. The country has spent billions to realize its ambition of being among the world's leaders of technology. Further ambitions to make Dubai a *smart city* that enables all government services to be linked online with real-time monitoring systems through the Internet of Things (IoT) are fueling further investment.

At present the average download speeds for the UAE is 30.79 Mbps, placing it 54th in world rankings, whereas the global average speed is 45 Mbps. With high Fiber-to-the-Home (FTTH) penetration, the UAE has the scalability to increase its average download speed very easily.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **10.0/10**

Dubai's mobile internet platform is fit to rival the world's leaders. With the average mobile download speeds recorded at 53 Mbps, it is ranked sixth against a global average of 23 Mbps. Dubai's mobile platforms are set to grow larger in scope and capacity. It has ambitious plans for becoming an early adopter of 5G technology providing between 1-to-10 Gbps that will enable large-scale adoption of internet-enabled devices connected globally via IoT.

OPEN DATA

SCORE: **6.7/10**

A smart city should be able to harness the vast amount of data produced by both its citizens and things that operate within its digital sphere. More importantly, it needs to take decisive steps to open up government data to public use to enable societal development and economic growth.

INFORMATION AND DATA SECURITY

SCORE: **6.7/10**

When it comes to large-scale digital transformation, Dubai has been the regional risk-taker. For almost two decades, the city proved to be a trendsetter in embracing digital technology by:

- Adopting cutting-edge digital governance approaches
- Utilizing information and communication technologies for development
- Adjusting policies and regulations to adapt to rapid societal changes and technological advancements
- Providing enabling infrastructures for internet businesses
- Creating a hub for a knowledge economy that extends to the wider region.

PLANNING AND POLICY

SCORE: **6.7/10**

The Dubai Data Establishment is the championing body that will drive forward the use of open standards, develop updated legislation and oversee the application of policies and procedures. It acts as the enabler that provides entities with best-practice procedures by drawing on international exemplars and case studies, support and tools.

URBAN SYSTEMS
6.3/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.4/10**

Dubai Electricity and Water Authority (DEWA) is the exclusive provider of electricity services in Dubai. One of the core objectives of DEWA is to support Dubai Plan 2021 by promoting sustainable development by using energy efficiently and investing in alternative energy sources.

DEWA is also committed to achieving the strategic objectives of the Dubai Integrated Energy Strategy 2030, which include diversifying energy resources and improving the efficiency of electricity usage. By 2030, DEWA aims to generate 71 per cent of its total power output from natural gas, 12 per cent from nuclear power, 12 per cent from *clean* coal and 5 per cent from renewables. At the same time, it hopes the demand for energy will fall by 30 per cent.

DEWA also has a role to play in trying to make Dubai the world's smartest city within three years through three ground-breaking programs:

1. Installing photovoltaic solar panels on houses and buildings to generate electricity to be used on the premises or fed back into its grid
2. Providing smart meters that give automatic and detailed readings, allowing customers to monitor actual consumption and manage bills
3. Establishing electric vehicle infrastructure and charging stations around the city.

DEWA supports the introduction of electric vehicles to decrease air pollution and protect the environment against the impact of transport sectors in the emirate.

WATER TREATMENT AND DISTRIBUTION

SCORE: **4.8/10**

DEWA is also the primary provider of clean water services in Dubai, establishing, managing, operating and maintaining water desalination plants and water transmission and distribution networks.

As part of the Dubai Integrated Energy Strategy 2030, DEWA aims to reduce water demand by reverse osmosis, water reuse and efficient irrigation and replace standard taps with ones equipped with sensors.

Dubai Municipality plays a key role in the development of wastewater treatment infrastructure in Dubai. It has a gray water treatment plant for irrigating parks and trees and solar systems to run landscaping irrigation on traffic roundabouts. It is using environmentally biotrickling filters in sewerage pumping stations to remove odorous gases from wastewater.

At present, 76 per cent of water used for landscapes is treated sewage effluent. By 2030 the municipality plans for it to reach 100 per cent.

WASTE MANAGEMENT

SCORE: **7.8/10**

Dubai aims to achieve zero waste to landfill by 2030. A citywide plan, including more alternative waste management infrastructure and increased tipping fees, has been introduced to facilitate achieving this goal. The only closed-off landfill site in Dubai was remediated into a park and a similar exercise is expected for future landfill sites. The city already has reduced municipal waste generation through public awareness programs and higher fees.

Dubai Municipality has announced that it will establish the largest plant in the Middle East to convert solid waste into energy at a cost of CAD710 million in the Warsan district. The move is in line with the national agenda to reduce landfill by 75 per cent by 2021 and to protect the environment from methane gas emitted by landfills. By the middle of 2020 the plant should be turning 2,000 tons of solid waste into 60 MW of electricity each day. The waste incineration project is the first of four projects to produce green energy.

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17





BEIJING

As the capital and cultural center of the People's Republic of China, Beijing is one of the most crowded and visited cities on earth. Steeped in 3,000 years of history, Beijing has seven UNESCO World Heritage Sites, all of them popular tourist attractions. The city sits on a plain not far from the sea in the north of China and is surrounded by mountains to the north, northwest and west.

AT A GLANCE

RANKED **17**
CITY SCORE: **25.25**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
5.6/10	**7.2/10**	**6.0/10**	**6.4/10**

Dubbed the *Billionaire Capital of the World*, Beijing is an economic powerhouse. It is regarded as China's political, business, cultural, entrepreneurship and education hub. The 2008 Olympics and Paralympics helped to transform the cityscape and improve transport networks. Iconic buildings such as the Bird's Nest (Beijing National Stadium) and the Cube (Beijing National Aquatics Center) gave the city a new sense of pride. The events also had a significant impact on Beijing's economic development and the growth of its service industry. In 2022, Beijing will host the Winter Olympics — making it the first city to host both Games.

Increased wealth and improved healthcare mean that life expectancy in Beijing continues to grow, although there is concern about how the city will support a large elderly population. The goal of Beijing's latest city plan is for it to become a "world-class harmonious and livable city". Two of the major objectives in the plan are to remove non-capital functions and to solve big city diseases. The first objective is based on coordinating development in Beijing and its surrounding regions. To meet the second objective, the government is attempting to control the growth of the urban population along with other measures.

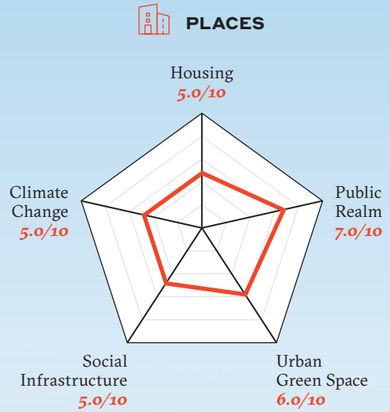
Rapid development has created significant challenges for Beijing. The city's smog is infamous. The authorities report daily on the level of fine particle matter. Targets have been set for improved air quality and the government has ordered major heavy industries, such as steel and concrete, to reduce their emissions or leave the city.

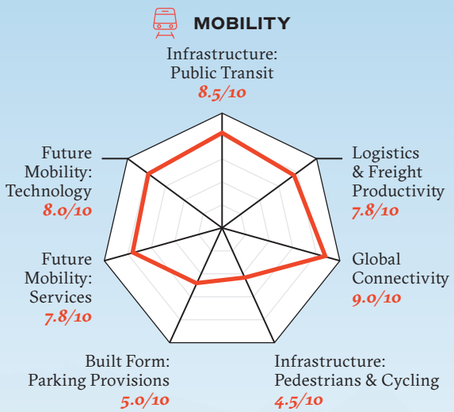
Recent research suggests that climate change and its influence on weather patterns may also hinder Beijing's efforts to reduce the smog. In a bid to resolve its severe traffic congestion, Beijing has introduced traffic management controls, increased investment in the public transport network and encouraged people to use it. To enhance the city environment, there are plans for more parks, bike paths and green belts as well as water and wastewater infrastructure.

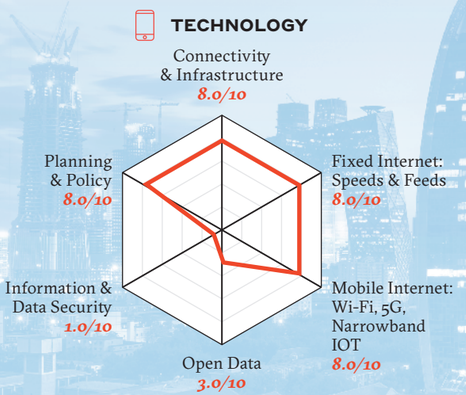
The Chinese Government's thirteenth Five-Year Plan includes ambitious goals for social policy expansion with a focus on health, education, housing, pensions, disability and poverty. While these social issues are acknowledged, many others such as the widening wealth gap and gender disparity are not being addressed because of political sensitivity.

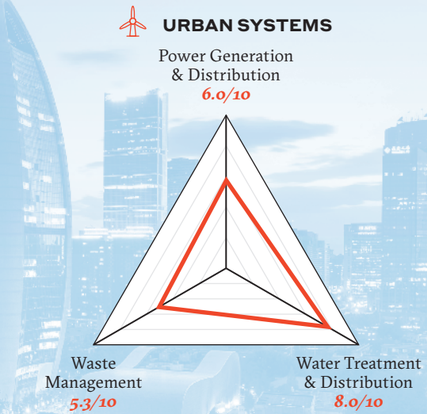
Will the forces at play in Beijing converge to shape this complex metropolis into a truly global city?

CITY ASSESSMENT









PLACES
5.6/10

HOUSING

SCORE: **5.0/10**

Policies on housing and urban/rural development are mandated by the Beijing Municipal Commission. The government provides different types of housing to fulfill different needs: commercial, limited price, shared property, public rental and self-occupied that can be sold after a specified period. The government also has several policies to regulate the price of housing.

PUBLIC REALM

SCORE: **7.0/10**

Beijing celebrates history and culture within its city center but there's a marked shortage of green space and a huge surplus of illegal construction. The municipal commission is tackling the problems through special measures that involve dismantling illegal structures and disposing of the construction waste to allow enough room for green space creation. The city has so far demolished 40 million square meters of illegal construction. It will upgrade 615 backstreet alleys, strictly following street and lane design guidelines. The commission will continue to promote the central urban area, upgrade Tongzhou District back street lanes, transfer overhead lines to underground, and complete main and secondary trunk roads and associated street furniture within the core area.

URBAN GREEN SPACE

SCORE: **6.0/10**

From this year, Beijing plans to build 3,872 hectares of park in and around the city center. This will include urban forest parks, cultural theme parks and micro green parks. The city will build another 2.4 million square meters of ecological corridor from the north of Laiguangying area, along the Xiaoqing River and east to Jingcheng highway. The ecological corridor will finally connect to South Fifth Ring Road. Most key roads will also have boulevards.

SOCIAL INFRASTRUCTURE

SCORE: **5.0/10**

As well as promoting economic and social development, China's thirteenth Five-Year Plan (2016-2020) focuses on education, a theme that has been taken up with enthusiasm in Beijing. By 2020 the capital plans to have a fair, high-quality, innovative and open education system that will have fulfilled all the tasks set out in the Beijing Medium and Long-Term Education Reform and Development Plan 2010-2020. Attendance rate targets have been set at 95 per cent for pre-school, 100 per cent for compulsory, 99 per cent for high school and 60 per cent for higher education. Half of workspace employees will have higher education.

The capital has invested in building 843 new kindergartens, 200 new primary and secondary schools and 65 more integrated urban and rural schools.

Beijing is promoting itself as the capital of art performance by offering 30 to 40 per cent off ticket prices. Last year 24,000 art performances in the city attracted a combined audience of 10 million, each person paying an average of less than CAD20.

The thirteenth Five-Year Plan also is aimed at protecting original streets and the ambience of alleys while building 10 new national museums.

CLIMATE CHANGE

SCORE: **5.0/10**

To control carbon dioxide emissions, the Ministry of Ecology and Environment has stipulated 12 key supervisory tasks from steel mills and oil refineries to construction sites and petrol stations. This year the Beijing Municipal Commission of Development and Reform is administering a carbon emission trading trial for 621 enterprises. The enterprises will submit their carbon dioxide discharge report to an online system and those with a discharge of more than 5,000 tons will be supervised by key discharge units.

MOBILITY
7.2/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **8.5/10**

The thirteenth Five-Year Plan calls for the expansion of the subway transit network to 900 km of track. Construction of four subway lines will begin this year and two railway lines will be completed. Building of the S6 line linking Beijing with Baizhou, ZhangJiaKou, TangShan, BinHai and ShijiaZhuang will speed up travel.

Beijing already has 12 transport hubs where passengers can change from subway to bus or vice versa. Three new hubs are being built at Science City, Wangjing West subway station and Tonzhou district, of which the latter will cover 70 hectares and be the biggest in China.

All transport modes have used a contactless ticketing system since 2006. A newer system allows passengers to download a mobile application, which scans QR codes when taking the subway.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **7.8/10**

The city is fast-tracking the construction of four logistics bases to improve international flows, express package distribution function, and regional links in the Beijing-Tianjin-Hebei region.

The Ministry of Transport and National Development and Reform Commission have jointly agreed on the building and distribution of 46 multimodal freight hubs in different counties.

GLOBAL CONNECTIVITY

SCORE: **9.0/10**

Last year, Beijing capital airport handled 95.79 million passengers, a growth of 1.5 per cent, and the volume of airfreight passed 2 million tons. Meanwhile, a new capital airport in Daxing District, begun in 2014, is expected to open next year.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **4.5/10**

To ease traffic congestion, the municipal road management department is building or repairing 900 kilometers of pedestrian/cycling path this year. More than 136 roads and streets will then have cycling paths.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.0/10**

In 2015, parking in the city was divided into three categories:

- The first and most expensive category covers the central business district, CuiWei business district and the rest of the area within the third ring road.
- The second category is the area between the third and fifth ring roads.
- The third and lowest fee category is outside the fifth ring road.

Parking fees also vary per the time of day.

Of the 3.82 million parking spaces in the city at the end of 2016, 2.19 million were in residential areas. The parking resources census report divided the city's 16 districts into 66,000 basic units according to parking availability and zoned them as sufficient, basic balance, insufficient, serious insufficient or non-residential.

The city recently began the testing of electronic toll collection for parking on 4,086 lots in 37 streets. The municipal government will expand the electronic toll collection system to the whole city by the end of next year.

FUTURE MOBILITY: SERVICES

SCORE: **7.8/10**

In Beijing, the private sector develops point-to-point, on-demand, ride-share and car-share services under policies decided on by the government. Since 2016, the Beijing Traffic Commission has managed the internet booking of taxis. Last year, the Ministry of Transport and the Ministry of Housing and Urban-Rural Development issued a joint guidance policy on the sustainable development of mini-car rentals. In 2016, the popularity of bicycle-sharing was in full swing, with the total number of bicycles reaching 2.35 million.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **8.0/10**

Last year, the Beijing Government began implementing a policy that requires electric vehicle charging facilities every five kilometers. The minimum ratio of charging facilities to total parking spaces is 1:4 for new office buildings, 1:5 for commercial buildings and community car parks, 1:1 for residential development, and 3:20 for other public buildings such as hospitals, schools and cultural facilities.

Beijing released its first road test license for driverless cars in March 2018.

TECHNOLOGY
6.0/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

The core of the strategy for a Digitalized Beijing is to develop information resources by efficient information management in order to modernize communications and improve people's quality of life.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **8.0/10**

In 2011, the city has started free replacement of households' copper internet wires with fiber optic cable. The retrofitting will be complete in the next five years, after which the average broadband speed should reach 100 megabits per second.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **8.0/10**

After trialing Narrowband Internet of Things (NB-IoT) in dozens of cities across the country, China's telecommunications operator has expanded the project to 300 cities. During the same period, the operator has been testing the commercial viability of the Enhanced Machine-Type Communications (MTC) network in several regions, including Beijing.

China began testing 5G technology in January 2016, completed the first standard version in June 2018 and will complete a full version in September 2019 ready for it to be available commercially by 2020.

OPEN DATA

SCORE: **3.0/10**

China has issued a summary of government information disclosure every year since 2014. This year's summary lists 16 additional items in these areas: credit, health, safety, quality, finance, medical, culture, resources, education, geography, statistics, employment, agriculture, environment, meteorology, transportation, social security, enterprise registration and science and technology.

INFORMATION AND DATA SECURITY

SCORE: **1.0/10**

China has nearly 40 laws, 30 ordinances and 200 regulations on personal information protection, but they're not found in any one place. There are many inadequacies in the realm of personal privacy, and the sale of personal data is common in the big underground data market.

Last year, the National Information Security Standardization Technical Committee released the second draft of the Information Security Technology-Guidelines for Cross-Border Data Transfer Security Assessment for public comment. It includes a Personal Information Security Standard.

PLANNING AND POLICY

SCORE: **8.0/10**

Last year, the Ministry of Industry and Information Technology submitted a recommendation for the development and sharing of telecommunications infrastructure. It will explore innovative methods to speed up the construction and sharing of telecom infrastructure in Beijing.

URBAN SYSTEMS
6.4/10

POWER GENERATION AND DISTRIBUTION

SCORE: **6.0/10**

China aims to increase renewable energy to 15 per cent of total energy consumption by 2020, 20 per cent by 2030 and 60 per cent by 2050. By that date it hopes to be generating 2.7 gigawatts a year from solar power, a 90 per cent improvement on the 29 megawatts of 2014.

Renewable energy projects are also being built in 2017 in Chengde, Chifeng, Zhangjiakou and Wulanchabu (Inner Mongolia) to supply additional power to the Beijing-Tianjin-Hebei region.

After modification of smart grid infrastructure in the Chaoyang district in 2017, the electric equipment will automatically distribute power to most of Beijing's households. The power supply reliability within the fourth ring area will be 99.9 per cent. The whole smart grid infrastructure will be completed by 2020, extending the automatic power distribution to the fifth ring area.

Between 2012 and 2016, Beijing installed the smart metering system for 6.3 million resident users who can download an app to pay for their electricity.

Since 2013, households have been encouraged to install solar panels to generate their own electricity under the National Energy Administration's Interim Measure for the Management of Distributed Photovoltaic Power Generation Project. Their excess generated electricity could be connected to the electricity grid and sold to the electricity company. Now households with solar power will be financially rewarded by the local government, as stipulated by the National Development and Reform Commission.

WATER TREATMENT AND DISTRIBUTION

SCORE: **8.0/10**

In 2016, the government restricted total water use within semi-arid Beijing to 4.3 trillion liters, which represented a cut of 20 to 30 per cent.

To bolster the limited water supply, the Beijing Municipal Government embarked on a three-year action plan to accelerate the sewage treatment of a black and smelly river and to discover potential sources of renewable water. As a result, 1081 kilometers of sewage pipeline will be built or replaced, 14 sewage treatment plants will be upgraded or relocated into parks, 472 kilometers of recycled water pipeline will be built, and 27 recycled water treatment plants will be built. The historical practice of sewage being dumped from 760 villages will be strictly prohibited as the black smelly river gradually reverts to a clear fragrant river.

WASTE MANAGEMENT

SCORE: **5.3/10**

A city management meeting last year decided that to eliminate dumping into landfills of the 30,000 tons of waste generated in Beijing each day, 24,250 tons would be incinerated and 6,350 tons would be treated with biochemicals every day. Six garbage incineration towers will be completed this year. At the same time, a garbage classification and recycling system will be promoted. By the end 2020, each community will establish a garbage classification center.

The existing landfills in China are mostly used for greenwood, not for construction materials or multipurpose waste. During their 20- to 30-year design life, greenwood landfills settle less than construction or multiwaste landfills because greenwood degrades less. With comparatively favorable soil mechanical properties, previous greenwood landfill sites may serve as multistory permanent building sites in the future.

Since 1 June 2008, supermarkets and other retail store stopped providing free plastic shopping bags to customers. But nine years later, the campaign has been judged as largely unsuccessful. There isn't any sustained or enforced waste reuse framework in Beijing.



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18

SEOUL

As the capital and largest metropolis of South Korea, Seoul is home to about half the country's population. Surrounded by a mountainous and hilly landscape, the city is strategically located on the Han River that previously served as a trade route to China.

AT A GLANCE

RANKED **18**
CITY SCORE **25.22**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.4/10	**6.5/10**	**8.3/10**	**4.0/10**

Fondly referred to by residents as the *Soul of Asia*, the city moves at a fast pace with a pulsing energy that's reflected in its culture of hard work, service and friendliness. The birthplace of K-Pop, Seoul is experiencing a creative renaissance.

As the commercial and financial hub of South Korea, its economy is driven by manufacturing, information technology, electronics and assembly-type industries as well as food and beverage production and printing and publishing. It is the headquarters of some of the world's best-known manufacturers, including Samsung, LG, Hyundai, and Kia.

Following an economic boom in the 1950s, South Korea was transformed from a developing nation to a developed one. Seoul was in the vanguard. Now greater Seoul has a bigger population than the whole of Australia and can truly be called a megacity. High-profile architecture, excellent museums and an influential art scene are some of the hallmarks of Seoul alongside world-leading internet connectivity.

With a population density almost twice that of New York, three times higher than Paris and four times greater than Los Angeles, Seoul does not have much room to grow. The city is divided into 25 districts or boroughs called gu. Each gu has its own government and is split into several neighbourhoods, called dong, that vary in size and population.

Since 1990, the Seoul Metropolitan Government has issued periodic City Development Plans as the highest level of policy for the following 20 years. The fourth plan, issued in 2014 and looking ahead to 2030, has a broad framework covering social, economic, environment/energy, transportation/infrastructure, culture and welfare. Its policy and detailed action plan have limitations since Seoul is a metropolis of 10 million homes with inherited complex regional characteristics. Putting the plan into operation often means negotiating civil complaints and allowing an adjustment period.

One of the biggest obstacles to transport policy is in persuading people of the need to move from private cars to public transport, even in Seoul, which is the policy and geographical hub of efforts for a low-carbon, green environment. In addition to the National Core Transport Network Plan, the Ministry of Land, Infrastructure and Transport has created a high-level plan for metropolitan areas. Long-range policies and plans to solve metropolitan traffic problems rely on the meshing of high-level and local government plans.

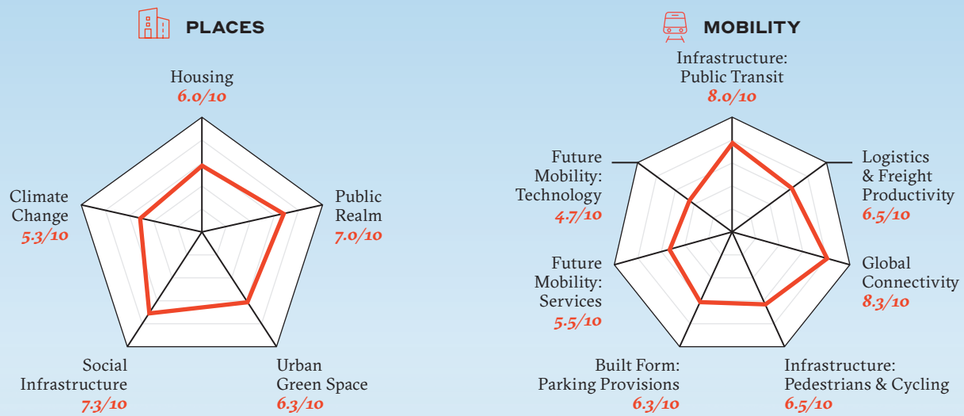
With Seoul's Culture Vision 2030 plan focused on using creativity and culture to create a happy and engaged city that is also prosperous, the city is tackling broader social issues.

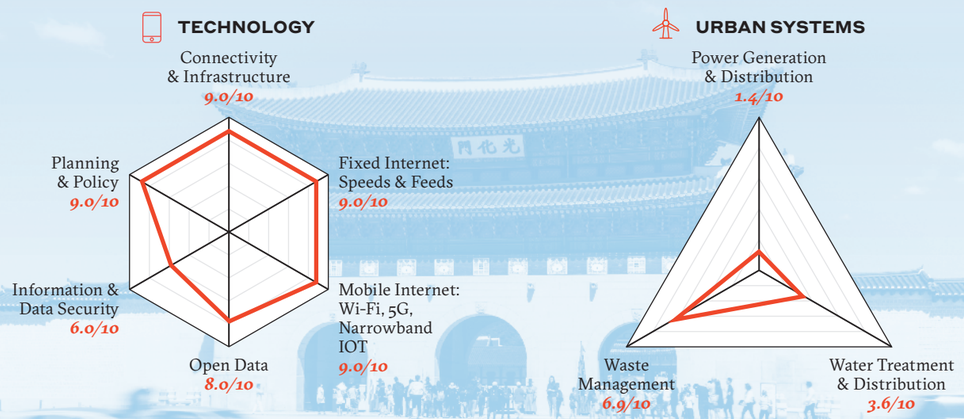






CITY ASSESSMENT





PLACES
6.4/10

HOUSING

SCORE: **6.0/10**

The highly-developed urban environment of Seoul results in serious sprawl to surrounding districts, even in the city-designated green belt and development restricted areas. The commuting area has expanded to a 40-kilometer radius and half of the country's population is concentrated in the capital area, causing an imbalance in the development of the country. Even the city understands the problem. There is no practical solution since it requires integrated government action.

Some relief may be over the horizon. Today's population within the city limits is 10,112,000 but it is expected to fall to about nine million by 2045 because of a low birth rate of 0.94 per cent. For now, housing costs keep rising. To control the overheated market, Seoul is trying to increase the ratio of public housing for rent to 10 per cent of the housing stock by building 10,000 rental units a year and expanding mortgage support to low-income renters through the National Housing Fund.

Seoul is working on providing a support system for senior and disabled people with consolidated community facilities. It plans to increase the number of Housing Welfare Centers from one for every two or three boroughs to one center for each of the 25 boroughs.

Apartment buildings account for 42 per cent of dwellings in the city and it has design guidelines for them that consider the environmental quality of the block plan, landscape, traffic, open space and public facilities.

PUBLIC REALM

SCORE: **7.0/10**

In the city plan there is a lot of emphasis on public places and how citizens connect with them. The city fosters the use of more recently established parks such as Seoullo 7017, built atop a former highway overpass, Gyeongchun Line (Railroad) Forest, and Oil Tank Culture Park.

Enhancing the public realm means authorities face objections from conflicting interests. Often big open space projects entail extra traffic congestion during construction and even after completion. For instance, Gwanghwamun Plaza is struggling with complaints about expected traffic congestion since the elimination of four traffic lanes in the city center. Similar problems arose during the restoration of Cheonggyecheon Stream in downtown Seoul and the building of Seoullo 7017. The city is already weighed down by a massive volume of traffic despite its affordable public transport system.

Seoul Riverfront Vision 2030 provides a framework for the revitalization of areas along the 41.7 kilometers of the Han River that runs from east to west across the city. Twenty-seven districts are involved in the plan that aims, among other things, to nurture a million square meters of forest along the river bank, which will be the axis of an urban ecosystem to secure biodiversity.

URBAN GREEN SPACE

SCORE: **6.3/10**

At present about a quarter of Seoul's area is devoted to green space, or about 16.5 square meters per resident. Whereas big parks such as the one created for the 2002 World Cup were the focus of efforts around the turn of the century, recent projects have utilized and regenerated spare land and incorporated private sector participation.

The Seoul Metropolitan Government has used this method to increase the number of parks located within 10 minutes' walk from residential areas. Green City Division of Seoul highlights "a thousand forests, a thousand gardens" as a primary goal, and sets five main tasks: reclamation of parks, extension of green area, empowerment of green culture, environmental protection and prevention of accidents.

The 2030 Seoul Plan outlines a vision for environmentally-friendly urban surfaces to increase water permeability by turning existing pavement into green surfaces.

SOCIAL INFRASTRUCTURE

SCORE: **7.3/10**

One of the biggest challenges facing Seoul is the serious polarization and social imbalances because of the huge gap between the circumstances of citizens of the established central city and those from the rest of the metropolitan area. To lighten the burden of underprivileged citizens, the city plans to increase the concentration of social infrastructure in the outer areas to minimize economic, generational and regional gaps.

In response to the rising cost of healthcare due to the aging population and obesity, the city is focusing on preventative healthcare services. The Cultural Policy Division of Seoul plans to double cultural infrastructure by 2030 and has set a target of 4.5 facilities per 10,000 residents.

Although the demand for schools is likely to continue to fall because of a declining and aging population, the need for childcare and after-school programs is rising. More families have both parents at work. The Seoul Metropolitan Government has set a target of having 35 per cent of children in childcare by 2030 but a lot of parents are against it because they fear it will result in a lower level of service.

As 48 universities are already located in Seoul, new campus plans are being made in other cities for balanced regional development. The city is focusing on investment, such as a campus town station, as part of a campus town development policy in partnership with an innovative startup entrepreneur and local business.

CLIMATE CHANGE

SCORE: **5.3/10**

Seoul has set a 2030 target of reducing its Greenhouse Gas (GHG) emissions to 40 per cent of 2005 levels as part of the global strategy on climate change. It hopes to do this by persuading people to use their cars less and public transport more. In addition, the Metropolitan Government has an Eco-Mileage Program that encourages citizen to reduce energy consumption of electricity, gas and district heating by giving incentives that can be exchanged for credit on public transport or environmentally-friendly products. Unfortunately, few citizens have shown any interest in the program.

There is no long-term plan for climate change measures beyond GHG emission reduction and relatively low understanding of systemic resilience issues and social and economic impacts.

MOBILITY
6.5/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **8.0/10**

Seoul is in the process of designing transport policies that focus on encouraging pedestrian, cycle and public transport through active traffic demand management (controlling passenger car traffic) and human-centered infrastructure supply (securing space for pedestrian, cycles and public transport).

The city has a railway system consisting of nine metro lines and one light rail route, which is part of the Seoul Metropolitan railway system consisting of 22 regional, metro and light rail lines. At present Metro 9 and the Shinbundang Line are being extended and the light rail Sillim Line is being built. Eight new light rail lines are planned.

Since the introduction of exclusive median bus lanes in the early 2000s, the system has expanded by about 15 kilometers a year, mainly on roads with heavy traffic congestion. Now 119 kilometers of exclusive median bus lanes are in operation, providing fast and safe bus services by connecting major arterial roads while eliminating congestion. By 2026, the system should be extended to 214 kilometers of lanes exclusively for buses.

There are plans for the expansion of metropolitan transfer centers and the park-and-ride facilities as well as providing extensive traffic information. Seoul Metropolitan's integrated transit fare card system has been in operation since 2009.

Last year, the newly built Gyeonggang bullet train line linked Incheon Airport to the port city of Gangneung, crossed the north of the country from coast to coast and connected Seoul to Pyeongchang, the Winter Olympics venues. It is now possible to travel by train from Seoul to South Korea's other big cities within three hours.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.5/10**

Compared with other global cities, Seoul has relatively mediocre logistic facilities and connections with transport networks.

Recently, Seoul authorities have tried to link metropolitan logistic facilities with the urban logistics complex in the southeast of Seoul. The city also wants to link major metropolitan expressways, such as the Seoul beltway, and logistic facilities to strengthen the connections to major corridors in the metropolitan area and arterial roads.

GLOBAL CONNECTIVITY

SCORE: **8.3/10**

At the beginning of the year, Incheon International Airport opened its second passenger terminal, boosting capacity by 18 million passengers to 72 million. Plans for 2030 envisage its capacity being stretched to 130 million travelers in a step-by-step expansion.

Meanwhile, the facilities are being improved and expanded at major ports in metropolitan areas such as Incheon and Pyeongtaek. Connecting railways and roads are in the process of being planned or built.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **6.5/10**

At present the city has about 670 kilometers of cycle paths with plans to double that by 2030. Then the focus will be more on expanding safety facilities and education.

In addition to pedestrian priority areas, projects for pedestrian and transit malls are being planned and put into operation.

School zones are in place around almost all elementary school areas. Those that reduce speed limits to help elderly pedestrians might also be expanded, although there is some doubt about their effectiveness.

BUILT FORM: PARKING PROVISIONS

SCORE: **6.3/10**

The metropolitan transportation plan emphasizes the need for parking management policy to help activate public transit. Meanwhile, a holistic approach is also necessary to solve the basic problems associated with the lack of parking facilities. In the downtown area, the city is expected to activate public transportation through rigorous parking control and park-and-ride expansion.

FUTURE MOBILITY: SERVICES

SCORE: **5.5/10**

Taxi services and carpool services are provided by private companies but with limiting conditions such as only for the commuting time slot.

A flexible transit service provided by a demand-responsive bus is in the process of establishment.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **4.7/10**

A test bed for autonomous vehicles is expected be developed in the city center area by next year under the Intelligent Transportation System Plan.

More electric vehicle charging stations are being provided but their effectiveness is the subject of controversy. Expansion of the hydrogen vehicle charging network is also envisaged in the plan.

A masterplan to promote the drone industry is being developed but at present most areas have flight restrictions and they are prohibited in some areas.

TECHNOLOGY
8.3/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **9.0/10**

Seoul is a leading player in smart industries and all infrastructure related to communication services is well-established. South Korea has 21 million high-speed internet connections and 64.3 million wireless communication service devices in the hands of subscribers. Considering it has a population of 51 million, the level of communication technology usage is healthy.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **9.0/10**

Ten-gigabit internet products were commercially available by mobile operators such as KT from late last year. That is about 10 times faster than present internet transmission standards around the world, making the products the core infrastructure equipment of the fourth industrial revolution.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

South Korea showed its high level of technological capability to the world by shooting 5G technology at the Winter Olympic Games in Pyeongchang in February. In addition, Seoul had a 5G demonstration site in Sangam Digital Media City. The 5G technology, which is used for self-driving cars and the Internet of Things (IoT), has a lot further to run.

OPEN DATA

SCORE: **8.0/10**

The regulation of the information disclosure system was established in 1996 and revised in 2013. The system operates for all public organizations. Seoul has also established a monitoring system in which citizens can directly participate in inquiries and requests for information.

INFORMATION AND DATA SECURITY

SCORE: **6.0/10**

The Ministry of Public Administration and Security surveyed the status of personal information from 2013 to 2017. It analyzed security status-based field inspections, reports and consultations, and the number of personal information leaks. According to the results, the government's response to personal information disclosure was mainly post-processing rather than prevention. After 2014's large-scale disclosure of personal information incidents, the number of accident counselling and cases decreased significantly by working to prevent security and information disclosure.

PLANNING AND POLICY

SCORE: **9.0/10**

The present national government formed the Fourth Industrial Revolution Committee and announced the I-Korea 4.0 policy. The plan expects to grow by 2022, based on the internet and big data in social and industrial innovation such as finance, medical and manufacturing. Accordingly, it is expected that the communication infrastructure will become a top priority.

URBAN SYSTEMS 4.0/10

POWER GENERATION AND DISTRIBUTION

SCORE: **1.4/10**

Seoul follows the national Renewable Energy Policy of the Ministry of Industry, Trade and Energy as a framework for power generation. It has struck a chord with citizens. Seoul was selected as the city to have best carried out the national energy policies successfully by a survey conducted last year.

However, implementation plans often face strong critics. For instance, Seoul's One Less Nuclear Power Plant policy has encountered strong civil complaints and protest from local companies. Still, the city was willing to pursue the policy and able to accomplish its primary target. The authority continues to encourage awareness of the importance of renewable energy.

Since there is lack of regulatory flexibility to allow innovative solutions, it is required to invest in the development of relevant technology to be ready for novel methods.

WATER TREATMENT AND DISTRIBUTION

SCORE: **3.6/10**

The Seoul Metropolitan Government has responded to changes in the city's basic plan and the higher plan by establishing a stable water supply system case of an emergency, including an earthquake disaster. In addition, the basic plan for the readjustment of the city was systematically and reasonably changed to enhance national competitiveness in preparation for the opening of the water market.

Through these measures, the government established a plan for the mid-to-long-term, such as the introduction of an IT intelligent water network system.

The city has a four-stage plan to take it to 2030. To establish a stable production base, Seoul plans to undertake duplication of the water intake source, double lines of water distribution system, maintain an obsolete water pipe line and improve facilities at each water purification center. These measures should mean no major distribution of the water supply.

To carry out the plan for 2030, total investment is expected to be CAD6.2 billion and water bills should have risen between four per cent and 12 per cent from 2015.

WASTE MANAGEMENT

SCORE: **6.9/10**

Since 1990, the collection of recycled material has been expanded from apartment complexes to the whole area. As strict volume-rate garbage disposal system and food waste separation was implemented, the recycling rate of glass bottle, scrap metal, plastic, paper and plastic bags rose to a record 65.3 per cent in 2012. There are waste collection bins and recycling bins in private and public areas operated by a recycling center by each district.

Also, the city has tried to control the generation of waste. For instance, free plastic bags are banned and customers should carry their own bag or buy a paper one. All discharge requires payment by the volume of waste source except for the recyclable material.

However, the city is still struggling in waste collection and disposal. Two landfill areas in Seoul are facing their limits and another one in Nanji has already been converted to public garden where landfill gas is used for power generation. Now the city is sending waste and recycling materials to another city, a move that met strong opposition from the region. Moreover, the existing landfill area near the capital city is expected to reach its limit in 2044. It will be difficult to find extra landfill area due to civil complaints. Accordingly, a strong framework for waste management is required long-term.

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19

EDINBURGH

Edinburgh is the seventh most populous city in Britain and the second largest financial center after London. It's also well-known for education, particularly in the fields of medicine, Scottish law, literature, the sciences and engineering.

AT A GLANCE

RANKED **19**
CITY SCORE **24.17**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
6.5/10	**5.7/10**	**6.2/10**	**5.8/10**

Edinburgh is a city people are proud to live in, with its wealth of heritage, beautiful parks, renowned events and culture, tourism and a good social life. There is underlying confidence: the city center is still hugely attractive and developments are snapped up, and the central areas are steadily being rejuvenated. It's the seventh most populous city in Britain and the second largest financial center after London. Edinburgh's education sector and institutions are renowned, particularly in the fields of medicine, Scottish law, literature, the sciences and engineering. Its high level of education is linked to its success, attracting investment in fields such as biomedical science, but that very success brings its own challenges: house prices are high and demand exceeds supply, making Edinburgh the second most expensive place to live in Britain and challenging for political ambitions to achieve greater equality.

The City of Edinburgh Council (EEC) has a vision for the future and a plan to achieve its vision. Realizing this vision requires significant private sector involvement, which may constrain how readily Edinburgh can adapt to future challenges. The condition of some infrastructure, such as roads, needs urgent investment, like in other areas across the country.

Targets for development are ambitious, but access to funding is limited, a consideration when assessing the strategies in place. As the city expands, council support systems are coming under strain and many schools are already over capacity.

In 2017 the Edinburgh and South East Scotland City Region secured a CAD1.8 billion City Region Deal from the United Kingdom (UK) and Scottish Governments, signed off in 2018, to drive investment and address inclusion across the area. With its commitments to a regional skills program, to investment in innovation centers, key road and transport improvements, and to new funding for housing to unlock strategic development sites, fulfilling it involves universities, government and industry working in partnership.

Local authorities typically only have a 10- to 15-year plan, shorter than this review's 2035 horizon. However, Edinburgh is a member authority of SESplan, the Strategic Development Planning Authority for Edinburgh and South East Scotland, which has published the strategy for how Edinburgh and the area around it will grow to 2030 and beyond, highlighting how this city region will be easier to move around and provide better public transport options.

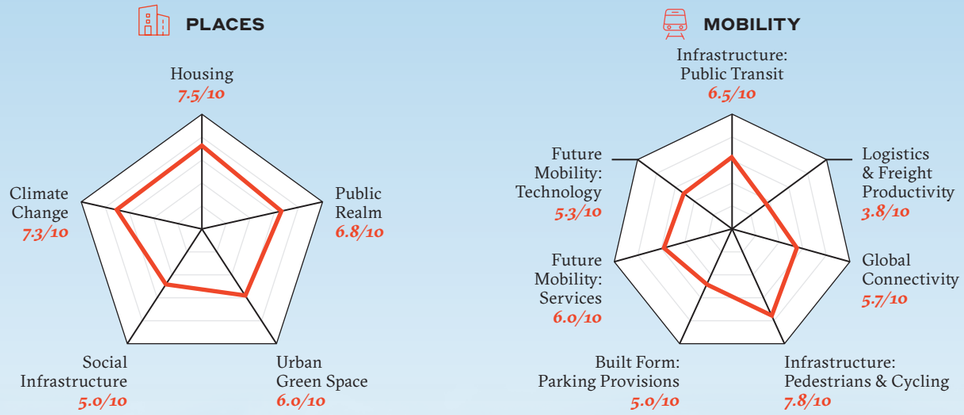
Significant proportions of funding for longer-term infrastructure, particularly transport infrastructure to enable development, must be from national public bodies, such as the Scottish Government and Transport Scotland.

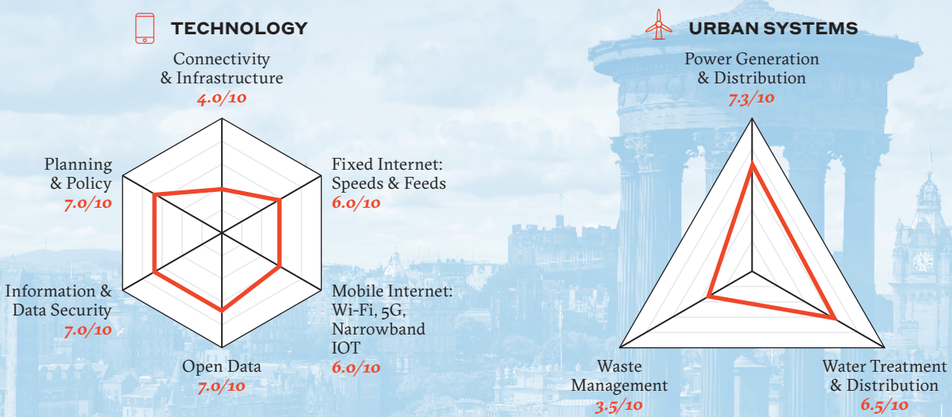
The tram system, opened in 2014, has proved popular – indeed, extra capacity is already needed at peak periods. There are extension proposals that will unlock a major regeneration area. Edinburgh also enjoys one of the best bus services in the country, controlled mainly by the city council. Congestion remains, however, a growing challenge.

Impacts of the megatrends surrounding climate change, societal change, technology and resource depletion are likely to exacerbate the challenges faced by the city. The Edinburgh Climate Change Adaptation Action Plan focuses on the risks of flooding, but there appears less focus on those caused by rising temperatures.

As house prices force younger people to move out of the city center, the city's age profile is likely to change in the lead-up to 2035. The demographic is expected to 'age' dramatically; those aged over 65 and 85 will increase by 52 per cent and 82 per cent respectively.

CITY ASSESSMENT





PLACES
6.5/10

HOUSING

SCORE: **7.5 / 10**

The need to develop affordable housing is addressed in Edinburgh's Local Development Plan (LDP), a strategy adopted in 2016 to increase affordable housing by 25 per cent. It was built on in the city's latest housing strategy, published this year, which acknowledges the forecast long-term population increase (nearly 17 per cent by 2035) and pledges CAD5.2 billion towards housing development in the city. It includes a commitment to building 50,000 affordable houses by 2020. There is funding to back this strategy, although its progress is unclear.

The city encourages compact development because it is surrounded by a green belt. Whilst this area faces pressures from the need to build housing, it remains protected by planning regulations. Amenities are considered in current housing design standards, such as the Edinburgh Design Guidance and Edinburgh Standards for Housing documents.

PUBLIC REALM

SCORE: **6.8 / 10**

The public is well catered for in the city center tourist areas. There is plenty of green space and the city is well-connected out from the center. Traffic, air quality and noise pollution are problems. The council has introduced a blanket 20 mph zone throughout much of the city center to improve the situation. It has also announced a 'car-free Sunday' pilot which will close the city center to traffic once a month.

Tram services are good, although extensions are required to other areas.

The LDP strategy includes the planning controls in place within the City of Edinburgh to govern the quality of streetscapes. Its future extent is unclear but includes plans to protect and restore urban waterfronts within the city and acknowledges their importance. The city is in the process of further developing ambitious plans for the public realm in the city, though the details of this strategy and its funding aren't fleshed out.

URBAN GREEN SPACE

SCORE: **6.0 / 10**

Edinburgh's urban green space strategy is set out in a section of the LDP and aims to protect, promote and enhance the value of the green network through various policies. It includes 11 areas where green space proposals are in place, indicating how Edinburgh is aiming to expand the network.

The plan mentions the importance of ensuring development does not increase flood risk, although streets are not specifically considered. It also discusses local nature reserves, but there is no mention of extending these areas.

SOCIAL INFRASTRUCTURE

SCORE: **5.0 / 10**

Edinburgh has a high percentage of private schools, a continuing feature that reflects the city's wealth. Its citizens are unusually well educated: of UK cities it has the third highest percentage of residents with high-level qualifications, behind only Cambridge and Oxford. Its hi-tech industries contribute significantly to Scotland's GDP but that success makes housing more expensive: a challenge for political ambitions for social inclusion and equality.

Edinburgh's LDP mentions schools and healthcare provision as part of the strategy for social infrastructure. Future school locations are determined through an assessment of proposed housing growth and existing schools. Planning permission for some of these schools has been granted, although funding might not be sufficient for the 10 schools proposed. The future expansion of Heriot-Watt University is mooted.

Demand pressures on healthcare will be higher with an increased population. The LDP outlines that Edinburgh Council and NHS Lothian will work in partnership to adjust existing healthcare facilities, which could mean providing services in a different way or providing new facilities.

Primary healthcare provision is mentioned in the LDP, which says that the Edinburgh Council will work in partnership with NHS Lothian to identify actions to meet future demand. Similarly, the LDP mentions child nursery facility development as part of the International Business Gateway.

Public institutions and expanded cultural assets are also included in the LDP, including the development of a new public library at the Craigmiller regeneration site. However, there is no overall strategy in place.

CLIMATE CHANGE

SCORE: **7.3 / 10**

The Edinburgh Adapts Climate Change Adaptation Action Plan looks to create a *climate ready* Edinburgh. It sets out a comprehensive package of resilience-increasing measures to implement up to 2020. Inevitably, with such a short timeframe, this does not address the levels of change expected by 2035, although it does recognize what changes are likely to occur. Actions identified focus on awareness raising and place, although the plan doesn't cover financing to achieve it.

The plan also reviews Edinburgh's vulnerability to weather-related risks, building on the UK Climate Change Risk Assessment 2017 Evidence Report, which also covers Edinburgh in detail. Some projects and actions discussed in the framework have been funded and are under way, and most of these are related to the risks caused by flooding. There is less focus on the risk of overheating, which is less understood and for which funding is harder to obtain. Most of the measures are listed as ongoing, although the plan only maps actions up until 2020 with no indication of further implementation.

As a part of the wider Edinburgh Partnership, the plan also considers more long-term resilience of the city in terms of both the economy and social resilience. As part of it, the Resilient Communities scheme works to encourage greater community cohesion in resisting the impacts of climate change.

Some projects are already under way as part of the Sustainable Energy Action Plan through the Covenant of Mayors to reduce the city's reliance on carbon intensive energy. A successful application for Salix funding in 2013 secured about CAD2.1 million to replace 7,200 street light units with more energy efficient units. The Living Lab for Energy has also been established as a place to encourage building users to create solutions for energy reduction. A majority of other suggested actions are yet to acquire funding.

MOBILITY
5.7/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **6.5 / 10**

Edinburgh's transport vision targets that by 2030 the transport system will be one of the greenest, healthiest and most accessible in northern Europe. Transport for Edinburgh recognizes the transport demands the city's quickly growing population will impose up into the 2040's. From a present of increasing congestion and fragility and reduced public spending it will make an impact on the intensive collaboration and cooperation across agencies needed to improve mobility, including integration of bus, tram and other transport modes, increasing modal shift to public transport, and establishing active travel infrastructure. Funding is a challenge, increasing the need for private sector involvement.

Planning applications for new developments must have a transport assessment to ensure the maximum feasible sustainable transport access. At the same time, the strategy directs new housing developments to sites that meet a range of criteria, including accessibility to public transport.

Edinburgh already has a remarkable bus network, with high bus usage, and is a rare example of a city with a publicly owned bus service that has managed to maintain its bus patronage. The routes network is under review as demand for radial movements is increasing.

The city's transport strategy aims to improve interchange facilities and increased integration and coordination. This includes a new interchange being built at Haymarket and strong support for coordinated ticketing.

The tram system currently connects the city center and the airport to the west, and although it has spare seats for much of the day, it runs at capacity in peak times. Plans for enhancing provision and extending the tramline are being taken forward, with future routes safeguarded, but are not expected to occur for a while. Plans for the eventual extension of the High Speed 2 railway north from England to Edinburgh (and a high-speed line to Glasgow) are now being taken up by central government in Scotland, and capacity at Edinburgh Waverley Station is being enhanced for increased demand.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **3.8 / 10**

The freight strategy in Vision 2030 mentions the possibility of consolidation hubs, although Edinburgh's transport strategy states that this is not feasible because of high costs and lack of similar examples. The movement of freight from road to rail and sea is also supported. It is important to safeguard these routes.

GLOBAL CONNECTIVITY

SCORE: **5.7 / 10**

International flights from Edinburgh airport are expected to continue increasing. The strategy focuses on improving the airport's accessibility through developing a gateway from the terminal to the tram stop and a park-and-ride facility.

Rail freight through the port of Leith has decreased and plans for tram extension to improve the accessibility of the docks are mentioned.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **7.8 / 10**

Edinburgh's cycle path strategy involves CAD21 million for two new routes. The cycle path network is considered in the LDP, the QuietRoutes initiative and a specific Cycle Action Plan in the Active Travel Plan, which aims for cycling to make up 15 per cent of trips. Edinburgh also recognizes the importance of cycle parking, resulting in required levels of storage in new developments, and the bike-and-go scheme.

An extensive pedestrian network is already in place. Expansions are considered as well as increased coverage of 20 mph zones following a successful pilot. However, funds are limited for the improvement of existing facilities. Funding contributions from developers are sought for any new facilities.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.0 / 10**

Parking options in Edinburgh include extending zones, increasing prices, varying permit charges on vehicle emissions and giving parking guidance on limits for new developments. The city recognizes that a decrease in parking provision needs to occur where accessibility to public transport is highest so 24-hour restrictions can be introduced.

FUTURE MOBILITY: SERVICES

SCORE: **6.0 / 10**

Edinburgh's Transport 2030 Vision briefly aims to improve demand-responsive transport. It introduces measures to encourage ride-sharing by giving priority to high-occupancy vehicles on the city bypass and motorway network. However, this strategy will not be undertaken in the city center because public transport accessibility is high.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.3 / 10**

Investment in charging infrastructure in residential areas between 2020 and 2023 should improve this network for electric vehicles. It is not clear if targets will meet demand as there are only 89 charging points in Edinburgh, 58 of which are available to the public. Codeplay, based in Edinburgh, is investing in driverless car technology, although the council has no overall strategy for the rollout of this technology.

TECHNOLOGY
6.2/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **4.0 / 10**

Edinburgh has a thriving and continually developing technology sector encompassing the private sector and educational establishments. The importance of supporting the development and investment to improve communications infrastructure to deliver growth, provision of services and citizen engagement is recognized at a city and wider Scottish Government level. Initiatives, such as CivTech, are driving innovation in service delivery and business growth, alongside the Edinburgh-based Scottish Government Digital Strategy that sets a clear action plan for implementation and investment through an accompanying Growth Fund.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0 / 10**

The city has one of the highest percentages — 83 per cent — of households connected to ultra-fast broadband. Edinburgh is now included in the first phase of BT Openreach's Fiber First program, which is tied to Britain's national Digital Infrastructure Investment Fund (DIIF).

Vodafone has a strategy that supports the national push. This fund aims to increase the number of homes with fiber-to-the-premises services in Britain. Although this strategy has funding from the Treasury, the strategy lags behind other European cities and critics argue that the funding is insufficient.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **6.0 / 10**

Edinburgh has committed to and funded a 10-year contract to enable free Wi-Fi access to residents and visitors throughout the city centre. No further plans have been published and there are no plans that explicitly mention the expansion of the 5G network.

OPEN DATA

SCORE: **7.0 / 10**

Edinburgh published an open data policy in 2014. In general, all cities and national governments should be able to provide open source data.

INFORMATION AND DATA SECURITY

SCORE: **7.0 / 10**

As with all British cities, Edinburgh is covered by the new UK information and data security law, the General Data Protection Regulation (GDPR), which came into effect on 25 May 2018.

PLANNING AND POLICY

SCORE: **7.0 / 10**

The City of Edinburgh published guidelines about installing communications infrastructure. The actual commissioning will be done by private companies under the national DIFF strategy, which faces criticism about long-term funding.

URBAN SYSTEMS
5.8/10

POWER GENERATION AND DISTRIBUTION

SCORE: **7.3 / 10**

Edinburgh's Sustainable Energy Action Plan includes targets of 30 per cent of overall energy demand met by renewables by 2020 and 100 per cent of gross electricity demand from renewables by 2020. It does not include clear strategies to achieve this target.

Some renewable projects are being funded to help increase the renewables proportion of the energy mix, including the Edinburgh Community Solar Cooperative SolarPV project using 25 council buildings, a review of potential sites for solar farms including unused council lands and former landfill sites, exploring the potential for large scale application of PV for car parking and hydrogen combined heat and power systems installed in six locations. The council is also funding the first phase of redevelopment of Saughton Park, which includes a micro-hydro scheme at Saughton Weir.

Projects for smart grids include the Smart Meter Street that aims to trial smart meters to demonstrate how energy can be saved. The first phase is funded.

The council has set up Energy for Edinburgh, an energy services company that will be charged with delivery of major energy initiatives included in the Sustainable Energy Action Plan.

WATER TREATMENT AND DISTRIBUTION

SCORE: **6.5 / 10**

Scottish Water provides Edinburgh's water supply and has a CAD6.1 billion 2015 to 2021 investment program that involves working in partnership with three new alliances to deliver improvements to existing assets. The LDP highlights that developers must consider water resources to prevent development in areas with inadequate water supply.

Marchbank Water Treatment Plant recycles wash-water. Scottish Water generates renewable electricity at several sites with plans to pilot the use of waste heat from sewage pipes. The new water treatment works at Glencorse in Midlothian has modern treatment processes and a capacity of 175 million litres daily. Whether this can cater for the growing population remains unclear.

WASTE MANAGEMENT

SCORE: **3.5 / 10**

Edinburgh's Zero Waste Project aims to build specific facilities for waste treatment, including waste to energy and an anaerobic digestion-of-food waste plant, which is being built.

Although there are no specific bans on waste in place and no framework for waste reuse, recycling is encouraged with an overall aim of 70 per cent of waste recycled and less than 5 per cent of waste to landfill by 2025. Similarly, there are no clear plans for landfill remediation in Edinburgh. Planning permission for new landfill sites will not be granted.

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20

As the third largest municipality in Canada, Calgary is a city young at heart with a median age of 36.8 years. Since being the first Canadian city to host the Winter Olympics in 1988, it has consistently won praise for its high quality of life based mostly on stability, healthcare and education.

Located in the foothills of the Rocky Mountains where the Bow and Elbow rivers meet, Calgary has a long and close history with the First Nations. The inner city is surrounded by suburban communities that are becoming increasingly densified. There are several planning and rejuvenation initiatives being undertaken to increase livability.

As a major urban center for the province of Alberta, Calgary's economy is largely driven by the oil and gas industry, as well as financial services, film and television, transportation and logistics, technology, manufacturing, and more. Importantly, it is a vital hub of business, housing a huge number of Canadian corporate head offices.

Calgary focuses on building strong, inclusive and sustainable communities. A key project is the Green Line Light Rail Transit line, an important addition to Calgary's connectivity and mobility. It will connect to 10 planned transit-oriented development stations and serve more than 27 communities, creating places where people can live affordably with access to amenities, services and sustainable mobility options. Additional funding is being poured into the Bus Rapid Transit project and roads as well as affordable housing, arts and cultural spaces, and flood mitigation strategies.

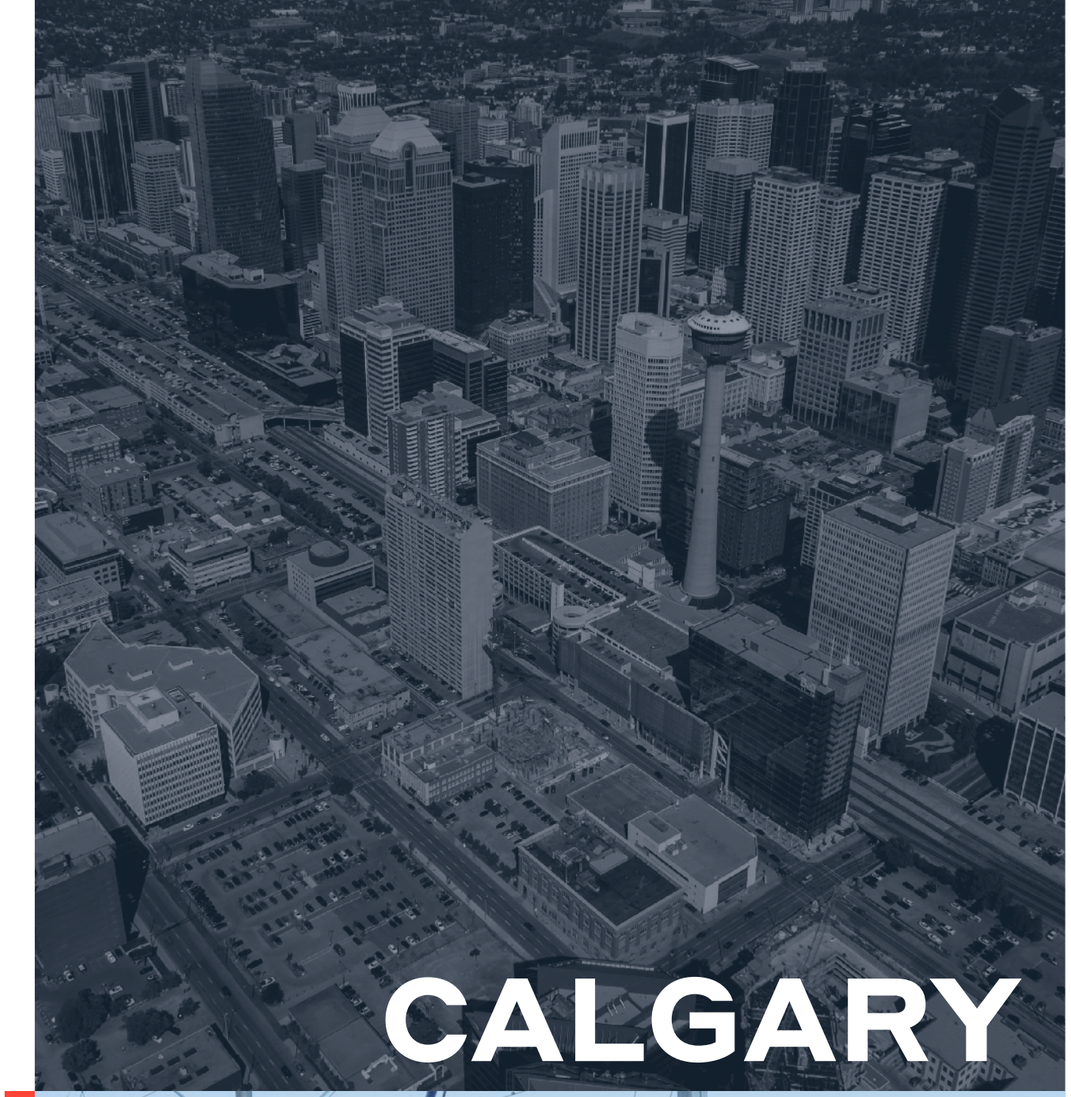
The city's vision for the future is to create an environment that is financially sustainable while protecting the natural environment and supporting a prosperous economy. It has identified key plans to respond to the needs and aspirations of its citizens.

Can Calgary continue to be one of the safest, cleanest and economically-stable cities in the world?

AT A GLANCE

RANKED **20**
CITY SCORE **23.76**

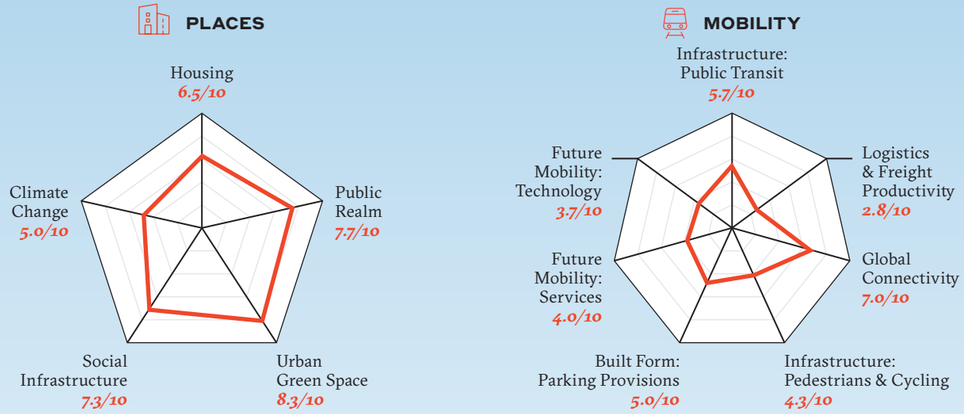
PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.0/10	**4.6/10**	**8.2/10**	**4.0/10**

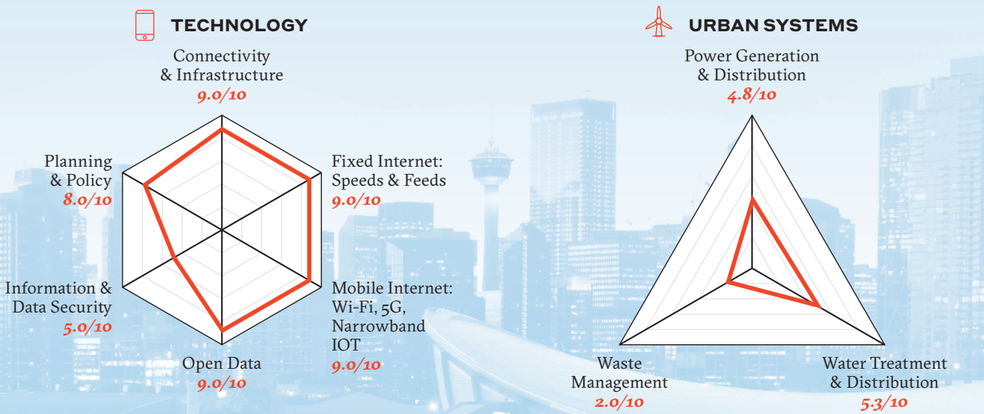


CALGARY



CITY ASSESSMENT





PLACES
7.0/10

HOUSING

SCORE: **6.5/10**

As the largest city of Alberta and the third largest city of Canada, the City of Calgary is home to a population of 1.2 million in 2016. It has multiple plans and strategies in place to ensure affordable housing. The City of Calgary's Action Plan (2015-2018) has identified Strategy P6 to increase affordable and accessible housing options, and the Calgary Municipal Development Plan (2009) has also emphasized the importance of sustainable local communities with a choice of housing forms, tenures and affordability.

The city has developed the Foundation for Home, a corporate affordable housing strategy that identified six objectives and actions from 2016 to 2025. Calgary's affordable housing plans also support compact development, especially in high density areas. The Capital Budget 2019-2022 Action Plan recommends a variety of built forms such as pocket developments, townhouses and mixed-use buildings.

Currently, only 3.6 per cent of housing in Calgary is non-market housing, well below the national average of 6 per cent in urban centers. The current vision is to bring the amount of non-market housing in Calgary to a minimum of 6 per cent to meet the national average. According to 2016 needs, this would require an additional 15,000 units to be built.

PUBLIC REALM

SCORE: **7.7/10**

The Calgary Metropolitan Plan has emphasized the importance of ensuring development areas are connected through walkable streets is encouraged on the municipal level, as well as the protection of the riparian waterfront as part of the region's plan to protect regional infrastructure. Multiple strategies and guidelines were developed to guide streetscape design in future development like the Complete Streets Guide, which details street design elements as well as funding strategies. A section of the Transportation Plan is also dedicated to designing multimodal streets. In addition, the Transit Friendly Design Guide, details design principles for transit-supportive streets. The city also produced Design Guidelines for Subdivision Servicing, Residential Street Design Policy and Street Capacity Guidelines.

The Municipal Development Plan included policies of Public Realm that emphasizes pedestrian-friendly streetscape design and outlines design principles for sustainable streetscapes in the Streetscape Guide. It presented policies that deal with creating connected plazas and squares. The Major Activity Centers section of the plan included policies that deal with the creation of successful public plazas and "key gathering areas". The Rivers Community District Revitalization Plan is a redevelopment plan that was developed in conjunction with an environmental remediation strategy and a flood protection initiative by the city.

URBAN GREEN SPACE

SCORE: **8.3/10**

The Calgary Metropolitan Plan was developed to encourage balanced growth that will fulfil the region's vision and aspirations: healthy environment, prosperous economy, enriched communities, and sustainable infrastructure. It focuses on landscape connectivity and the conservation of the integrity of the ecological system and the creation of a Regional Open Space Strategy. One of its goals is to protect the natural environment and watersheds. It also emphasizes the importance of ecological restoration and the need to sustain ecosystem diversity.

There are numerous plans for ensuring the connectivity and the expansion of green space in Calgary. The city developed the Open Space Plan, Parks Urban Forest Strategic Plan, Urban Parks Master plan, Centre City Parks: Open Space Management Plan, Imagine Parks and the Natural Area Management Plan. The Streetscape Guide includes details on street integrated stormwater management systems and Pedestrian Zone Design that includes street trees. The Calgary's 10-year Biodiversity Strategic Plan was also developed to outline a comprehensive approach for conserving the natural environment and fostering biodiversity in green open spaces. The plan aims to create ecological resilience and includes methods to measure success.

SOCIAL INFRASTRUCTURE

SCORE: **7.3/10**

Alberta has allocated a substantial amount of the budget, CAD8.4 billion in 2018 to 2019, towards primary and secondary education to fund enrolment growth. An area of focus is the school nutrition programs includes a CAD16 million commitment to give 30,000 students a daily nutritious meal.

CAD461 million will fully fund the enrolment of an additional 15,000 students in 2018 to 2019, to help keep up with the forecasted enrolment growth. Overall, CAD6.2 billion is allocated towards public early childhood to Grade 12 instruction.

Tertiary education is another focus of the 2018 Alberta Budget that has allocated CAD6.1 billion towards Advanced Education to provide stable and predictable funding for post-secondary education. A tuition freeze helps maintain accessibility and affordability for students, and investments are being made to increase the number of post-secondary program spaces. For example, CAD6 million has been invested to begin the addition of 3,000 technology related tertiary educations seats and this funding will increase to CAD43 million a year within five years.

With an overall budget of CAD22.1 billion for healthcare in 2018 to 2019, the government has several initiatives to improve access to acute healthcare. Several capital investment projects are planned or ongoing that help meet the growing need for acute care beds, increased hospital capacities, and decreased wait times for surgeries. These projects include:

- Initiatives to assist alternate level of care for patients to move from acute care bed to community beds
- Construction of the Calgary Cancer Centre to be completed in 2023
- CAD17 million investment to complete construction at Foothills Medical Centre to increase surgery capacity and add more intensive care beds
- CAD17.6 million investment to complete renovations to the Peter Lougheed Centre's vascular surgery and women's health units
- Expansion of Alberta Children's Hospital neonatal intensive care unit.

Alberta has a primary healthcare strategy in place to help improve the province's healthcare system and increase accessibility for a growing population. The strategy focuses on building up the foundation of Primary Care Networks, Community Health and Mental Health Centers, and Family Care Clinics that offer primary healthcare to residents. In Calgary, a home-based primary care project was developed to support home-care clients and a Telehealth program to make healthcare more accessible to rural communities, increasing access to primary healthcare in the region.

Alberta has budgeted CAD248 million in 2018 to 2019 to support Primary Healthcare in the province. The government is focused on improving community care and home care to help support those who require daily assistance. Emphasis has also been placed on mental health and addiction initiatives with an investment of CAD87 million to support mental healthcare including the opioid response initiative and the implementation of the Valuing Mental Health program.

In the next year Alberta is investing CAD393 million, a CAD22 million increase from the previous year, to help families meet the cost of childcare and early education. Federal and provincial funding has also been allocated to increase the number of Early Leading and Childcare Centers in the province. An investment of CAD46 million for the next three years will provide an additional 4,500 places for childcare at an affordable price of CAD25 per day. While these steps will greatly help increase access to childcare, the cost may still be unaffordable for lower income families.

In Calgary's disclosed plans for capital investments in tourism, sport and culture, there are very few projects that relate to the expansion or planning for new cultural assets; most of funding goes towards operating costs. The projects that are related to the cultural assets, such as the upgrades to the Jubilee Auditoria, are largely unfunded in this plan. Calgary also has a broad cultural plan in place that involves a cultural resource framework, however this plan does not mention funding and states that operational funding for cultural facilities is below national averages.

Outside of these disclosed plans, there is evidence of some planning and funding, such as building the CAD245 million New Central Library (NCL) that also includes a CAD2 million NCL public art program.

CLIMATE CHANGE

SCORE: **5.0/10**

Through Calgary's Climate Program, a specialized team is dedicated to facilitating city, citizen and business actions to reduce human causes of climate change and prepare and adapt to the impacts. The team is developing a Climate Resilience Plan to be presented to council in mid-2018. The Climate Resilience Plan will outline the city's strategies and actions to improve energy management and reduce Greenhouse Gas (GHG) emissions (mitigation), implement risk management measures in preparation for current and future climate impacts (adaptation), as well as include a Climate Adaptation Plan and a Low Carbon Plan.

The Calgary Climate Change Accord has committed to bold GHG reduction targets for municipal operations and to pursue parallel reduction strategies in surrounding communities, providing recommendations on the municipal and community strategy. The Community Greenhouse Gas Reduction Plan has set a GHG emission reduction targets of 20 per cent by 2020; 50 per cent by 2036 and 80 per cent by 2050.

The Expert Management Panel on River Flood Mitigation, organized by the city following the 2013 flood, included several recommendations aimed at understanding flood risk. It is one of the City of Calgary's core strategies for building flood resiliency.

In 2016, Calgary undertook a Flood Mitigation Measures Assessment to develop recommendations regarding the future of its flood mitigation and resiliency. These recommendations were unanimously accepted by city council in April 2017. Flood mitigation and resilience for Calgary have been identified as one of the council's top priorities.

MOBILITY
4.6/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **5.7/10**

Calgary has consistently been considered one of the most livable cities in the world. Calgary's population is expected to continue growing, forcing the city to implement smart city planning such as its combined growth strategy that includes the redevelopment of inner city communities and growth on the city's outer edges.

The City of Calgary has taken a proactive approach to long-term planning to ensure that it can grow effectively without missing key infrastructure and transportation investments. The two main governing documents, the Municipal Development Plan (MDP) and the Calgary Transportation Plan (CTP), were developed in conjunction with each other and provide a long-term vision for Calgary. Other policy documentation and strategies have been developed with a shorter timeline in mind to implement the required actions from the MDP and CTP.

Calgary is currently investing in several transport infrastructure projects: opening of three new Bus Rapid Transit (BRT) routes with new station design, dedicated roadway, and TPMs; planning of Green Line Light Rail Transit (LRT) with enabling works construction currently under way; various roadwork improvements aimed at improving walking, cycling, and transit operations in various parts of the city; and construction of the Southwest Ring Road. Larger projects such as the Green Line LRT, BRT, and Southwest Ring Road have also seen some support from provincial and/or federal governments.

There is more transport choice and modal diversity (public transportation, cycling, walking) than in the last decade, and that is continuing to grow in Calgary as governments and industry work towards more awareness/public engagement and added investment. There are limited regional services (to Okotoks privately run, to Airdrie run by Airdrie Transit), but plans and considerations exist for future regional rail development through the former Calgary Regional Partnership, now the Calgary Metropolitan Region Board.

All Calgary public transportation is in one fare zone, and tickets can be purchased in advance, on buses, at LRT stations, or a monthly pass. There have been two unsuccessful attempts at introducing contactless ticketing in Calgary.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **2.8/10**

Calgary has set corridors for goods movement and is currently constructing road and interchange upgrades for those routes. The Goods Movement Strategy will consider growth of goods movement along major railways, interprovincial and international highways and air cargo into a cohesive strategy outlining policies, future investments and considerations such as emerging technologies and future trends to ensure economic development and quality of life.

No logistics network management through congestion measures are currently implemented — some congestion measures such as time limitations to truck movements and dangerous goods movement are in place — and are most likely to be elaborated on with the creation of the Goods Movement Strategy. About 30 projects targeted for goods movement and traffic growth are set out in the Investing in Mobility Transport Infrastructure Investment Plan.

There are limited examples of multimodal freight hubs. However, they are becoming more popular as shown by the new CN Calgary Logistics Park located off a CN rail line and near important highways and the Calgary International Airport.

GLOBAL CONNECTIVITY

SCORE: **7.0/10**

The Calgary International Airport (YYC) is a designated National Airports System airport. This means it is under a long-term lease with the federal government and managed by a not-for-profit airport authority, consisting of non-elected representatives nominated by local, provincial and federal governments, and other stakeholders. The airport authority has a long-term Airport Development Projects Plan and a midterm Cargo and Logistics Plan, but these are not publicly available.

YYC has recently undergone construction for a new terminal, runway, and expanding cargo facilities. These improvements allow for increased capacity, attract larger international flights and increase cargo operations. It is one of the fastest growing cargo airports in Canada, receiving 75 per cent of Alberta's air cargo.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **4.3/10**

Calgary currently has over 900 kilometers of pathways for pedestrians and cyclists to use, with a policy for major pathway cleaning after snowfall and year-round pathway maintenance.

Calgary's Pedestrian Strategy was approved by city council in 2016. The council approved 49 of the 50 recommendations. It rejected a lowering of speed limits to 40 km/h or 30 km/h.

Calgary has some policies in place to support increased active transport through bike parking. Although no policy provisions exist, there are recommendations for end-of-trip facilities, which are widely supported by industry and will only continue to become more popular.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.0/10**

The overarching parking policy document, Calgary Parking Policies, includes regional parking policies, car-share policies, and a Downtown Parking Strategy. There is a clear acknowledgement across various planning documents for the need to wisely manage parking across the city; however, lower parking provision approvals are largely approved at a development level. The Downtown Parking Strategy and other supportive planning policies have resulted in the increased use of the municipal transit system, especially in morning and afternoon peaks.

FUTURE MOBILITY: SERVICES

SCORE: **4.0/10**

Calgary has been reactive with the introduction of on-demand, ride-share, and car-share services. Regulatory amendments have been made to incorporate these initiatives.

Calgary has been slow with the introduction of future mobility services. The rapid evolving nature of this market risks the improper implementation in the city and adverse effects. A mobility trends review report, the Future of Transportation in Calgary (2017), explored future technologies and services but has not led to planning or policy changes for the identified technologies and services.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **3.7/10**

Regardless of firm strategies or policies for the implementation of future mobility, the consideration of new technologies can be seen in various studies and pilot projects approved by the city, such as compressed natural gas, electrification and automation of public transport.

Electric vehicle charging infrastructure is mostly owned and installed by private entities. Most are free to use for the public but limited to specific vehicle makes due to differences in charging infrastructure. The city itself does not actively install vehicle charging infrastructure but is currently developing an electric vehicle strategy.

TECHNOLOGY
8.2/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **9.0/10**

The City of Calgary progressively developed fiber network strategies to ensure essential digital connectivity and improve digital access to the city's services. Its Digital Strategy was developed to serve as a long-term plan for how it can leverage digital platforms to connect, communicate and engage with each other, with citizens and with other levels of government. A non-profit technology agency, Cybera, has developed a Digital Infrastructure Report for the State of Alberta that provides a detailed review of the province's current network connectivity, data center resources, high-performance and cloud computing resources, cybersecurity awareness and protection measures, data management policies and procedures. The report also outlines an overall review on digital infrastructure in the province.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **9.0/10**

The City of Calgary approved a Fiber Infrastructure Strategy in 2015 with annual updates. It recognizes the importance of digital connectivity and has been increasing its fiber optic footprint, focusing on connecting all city buildings, facilities and assets. The city has also planned for future need by creating excess capacity while deploying the fiber network. These unused fiber optic cable infrastructure is called *dark fiber*, which can be licensed to organizations to encourage innovation, economic growth and competition. A fiber optic network has also been implemented by the primary providers in the city.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **9.0/10**

The City of Calgary has a public Wi-Fi program that provides service in select city facilities or locations, currently available at all LRT stations and more than 30 sites within the city. The service is available to any member of the public at no charge.

Through their participation in the federal government's Smart Cities Challenge, the city has identified 5G technology as the future of cellular and Wi-Fi connectivity. It has the potential to enable and accelerate new innovations such as Industrial Internet of Things, field sensors, autonomous vehicles and connected vehicles, vehicle entertainment systems, and intelligent traffic systems. The initiated Make Way for 5G project includes the design and implementation of a public-private model for 5G enablement.

OPEN DATA

SCORE: **9.0/10**

The City of Calgary has an open data catalog and a data dashboard online (Open Calgary). This platform was created, "To facilitate the sharing of information, spark innovative ideas and foster a sense of collaboration among citizens". The dashboard allows citizens to monitor the city's performance and provide continuous feedback on the value of the data and the satisfaction of Open Calgary via an online survey.

As of 14 May 2018, 479 datasets were available for download free of charge and categorized by:

- Base Maps
- Business and Economic Activity
- Demographics
- Environment
- Government
- Health and Safety
- Help and Information
- News and Events
- Recreation and Culture
- Services and Amenities
- Transportation/Transit.

The open data platform is a component of the city's Transforming Government initiative that prioritizes a culture of constant improvement at the City of Calgary. In addition to this platform, the city also lists resources found elsewhere that are provided by it to further increase data transparency (including maps, statistics, police, etc.). The Government of Alberta also hosts an open dataset catalog with nearly 2,500 datasets openly available.

INFORMATION AND DATA SECURITY

SCORE: **5.0/10**

In 2013, the City of Calgary developed an Information Governance Policy to ensure the city's information is protected as a corporately-owned asset. An intended outcome of this policy was improved security processes for information assets and information management in alignment with the city's Information Principles, which includes the mandate that private information is protected according to the law. The City of Calgary also lists five different information management and security policies to outline the processes to protect private and sensitive information, as well as the proper management of information.

The Province of Alberta enacted the Personal Information Protection Act to govern the, "Collection, use and disclosure of personal information by organizations in a manner that recognizes both the right of an individual to have his or her personal information protected and the need of organizations to collect, use or disclose personal information for purposes that are reasonable."

Canada's federal government also has enacted the Privacy Act to govern the use of all personal information collected by the federal government and the rights Canadian citizens have to access information that has been collected. Additionally, the federal government has enacted the Personal Information Protection and Electronic Documents Act to, "Govern the collection, use and disclosure of personal information in a manner that recognizes the right of privacy of individuals with respect to their personal information and the need of organizations to collect, use or disclose personal information for purposes that a reasonable person would consider appropriate in the circumstances."

PLANNING AND POLICY

SCORE: **8.0/10**

The planning and policies for facilitating or commissioning communications infrastructure are regulated on a federal level. The Canadian Radio-television and Telecommunications Commission (CRTC) regulates and supervises broadcasting and telecommunications in the public interest across Canada.

The CRTC has a Three-Year Plan that outlines the key activities between 2017 to 2020, annual study of telecommunication services in Canada, and Telecom Regulatory Policy CRTC 2016-496 that applies to country-wide. Due to the exclusive federal jurisdiction in Canada, the City of Calgary has a limited role in influencing planning and policies.

URBAN SYSTEMS
4.0/10

POWER GENERATION AND DISTRIBUTION

SCORE: **4.8/10**

While Calgary does not plan to transition to 100 per cent renewable energy before 2050, there are plans in place to move to 30 per cent renewable energy by 2036. A 100 per cent renewable energy goal is difficult for the Province of Alberta as their largest contributor to the GDP is oil and gas mining. There are no clear plans for the city to transition to smart grid infrastructure and smart metering.

The city and the province have frameworks and funding programs in place to encourage innovation in energy generation and to support emerging energy generating technology. Alberta has an Energy Innovation Fund that is set to invest CAD1.4 billion over seven years for innovation projects in: oil sands, industrial energy efficiency, bioenergy, and green loans (loans for organizations that want to invest in energy efficiency and renewable energy).

The province has made investments in infrastructure for alternative energy sources such as solar, wind, and bio energy. It has created the Energy Efficiency Alberta Program to promote the reduction of emissions from residential and commercial properties.

The City of Calgary is developing an Electric Vehicle (EV) Strategy to meet the needs of this emerging technology. The EV Strategy is being developed as part of the Climate Program, since it represents one of the greatest opportunities to reduce greenhouse gas emissions from transportation. They too have invested in infrastructure for solar, wind, and bio energy.

WATER TREATMENT AND DISTRIBUTION

SCORE: **5.3/10**

For the long term, Calgary has a policy on regional water, wastewater, and stormwater servicing that provides a framework to ensure fiscal responsibility, balance economic and social development, and maintain a sustainable water supply for the region.

While a Stormwater and Rainwater Reuse Policy exists, it is still in draft form. As a result, resilience features for water systems are not yet in place. Industry experts and the city are working together to address stormwater and rainwater reuse. In the Pine Creek Wastewater Treatment Facility, the City of Calgary built a CAD38.6 million project, funded by the Canada Foundation for Innovation and the Alberta Government. It is a joint venture between the University of Calgary and the City of Calgary but will be put to use by research partners from Dalhousie University in Halifax, the University of New Brunswick in Fredericton, Trent University in Peterborough, Ontario, and the University of Alberta in Edmonton. The work will help in the development of alternative wastewater treatment systems that municipalities can use to remove potentially harmful contaminants from effluent to make drinking water safer and protect the ecology of water bodies.

Also in place is the Water Efficiency Plan 30-in-30, which aims to reduce the number of liters per capita by 2033. This will reduce the amount of resources pulled from the river basins as well as the resources needed to clean the water.

A 626.7 kW addition to the City's solar PV project inventory was completed at the Bearspaw Water Treatment Plant. The project saw the installation of 1,740 LG solar panels rated at 360 W. That's enough electricity to power over 100 average Calgary homes and displace an estimated 500 tons of greenhouse gas emissions per year (assuming about 1,200 kWh per year of production per installed kW). The project is anticipated to achieve a payback within 10 years by helping avoid an average of CAD90,000/year in electricity costs for the water treatment plant.

The city does have a plan to retrofit existing wetlands, stormwater management facilities and follows a Low Impact Development Framework and Stormwater Management Guidelines. However, funding for new stormwater infrastructure is limited and restricted to private developers.

WASTE MANAGEMENT

SCORE: **2.0/10**

The city describes a vision to lead the community towards zero waste through innovative recycling, composting and diversion programs. Its first target is 70 per cent waste diversion by 2025, an average across single and multifamily residences, businesses and organizations, and construction and demolition. The city has waste separation and recycling infrastructure and bylaws are in place requiring multifamily residences and businesses and organization to recycle. The strategy for managing construction and demolition waste is being revisited to reduce waste from this industry.

Other than these targets and regulations, the city has very few provisions in place concerning land-use plans for landfill remediation, controlling the generation of waste through initiatives such as single use plastics bans, or waste reuse frameworks.



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21





BRISBANE

Brisbane is Queensland's capital with an enviable lifestyle and growing international economy. A vibrant hub of economic, cultural and community activity, it draws businesses to invest, skilled workers to access job opportunities, international students to study and visitors to experience the natural environment.

AT A GLANCE

RANKED **21**
CITY SCORE **23.02**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
7.1/10	**5.1/10**	**7.3/10**	**3.5/10**

Brisbane is the main gateway to the South East Queensland (SEQ) region, a diverse region that will continue to grow and experience change during the decades ahead.

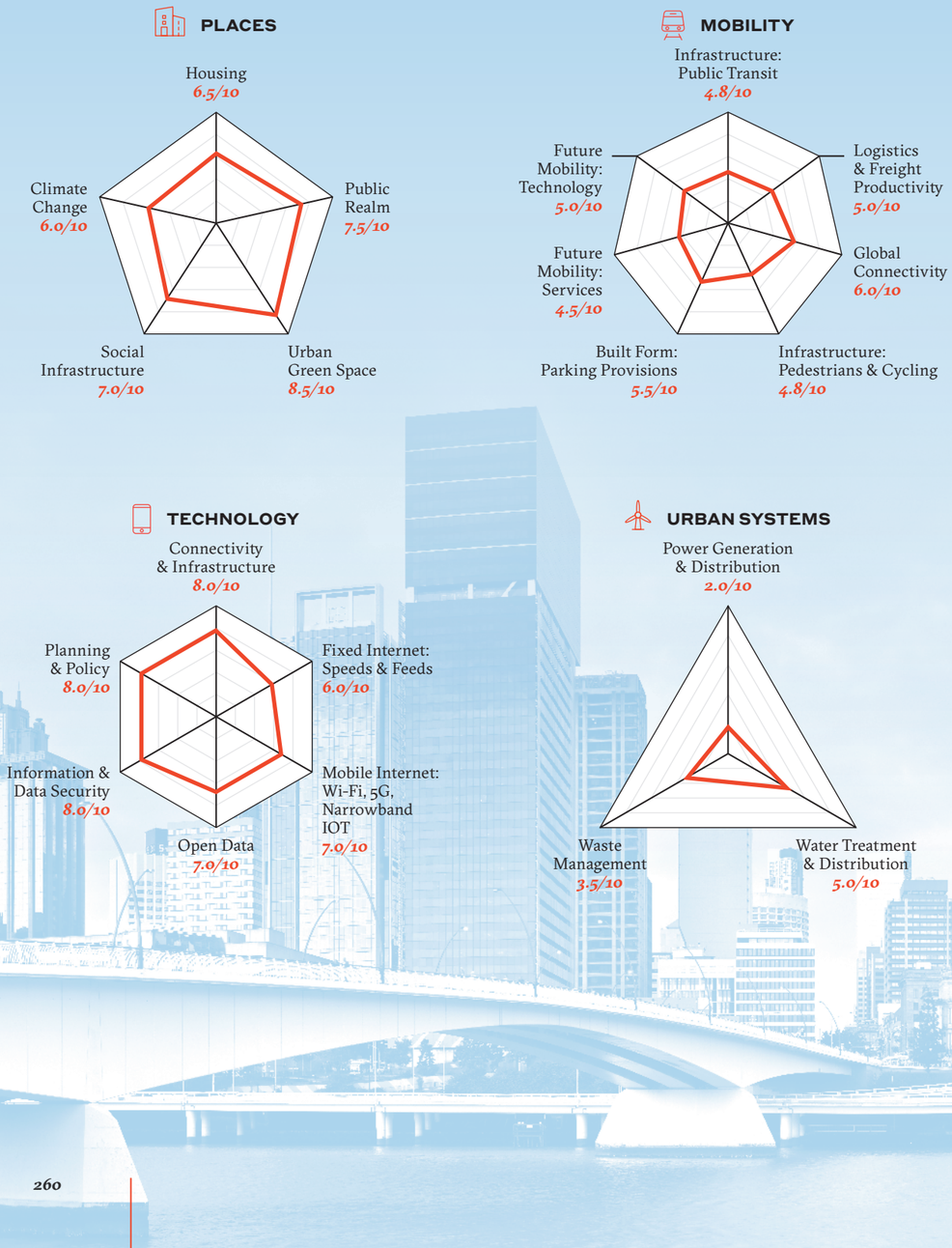
The SEQ region is a combination of heavily urbanized coastal areas separated by inter-urban breaks with semi-rural, rural and landscape areas in the west and south-west. Brisbane is the primary hub for employment, health, education and other services supported by a network of regionally significant activity centers in other Local Government Areas (LGAs).

SEQ is one of the fastest-growing regions in Australia. The Greater Brisbane metropolitan area includes the LGAs of Brisbane City, Moreton Bay Region, Redland City, Logan City and Ipswich City. Seventy-two per cent of Queensland's population lives in SEQ, making it the most important region in the state. Thirty-four per cent of SEQ population lives in Brisbane, which has one council body.

During the next 20 years, population growth will change markedly across key regions within SEQ. The Brisbane LGAs' share is likely to fall while greater growth occurs in the key satellite cities of Ipswich, Moreton Bay and Logan. However, employment growth is expected to remain strong in the Brisbane Central Business District (CBD) and surrounding inner precincts.

The regional plan, ShapingSEQ, takes a long-term view of planning for greater Brisbane and the SEQ region, aligning growth with infrastructure planning. With robust growth projected to 2035, the focus is on the existing urban footprint and specific areas of greenfield expansion.

CITY ASSESSMENT



PLACES
7.1/10

HOUSING

SCORE: **6.5/10**

ShapingSEQ brings together all levels of government involved in land-use and infrastructure planning so that critical infrastructure can be built to support housing supply and affordable living.

Brisbane's housing is predominantly suburban, with low- and medium-density housing. Forward planning seeks a balance between outward expansion and urban consolidation, promoting growth focused within the existing urban footprint to enable more efficient use of existing infrastructure, better access to employment, services and a wider range of lifestyles.

The Brisbane City Plan 2014 prioritizes higher-density development in growth nodes aligned to transport corridors and public transport, as well as creating urban villages in its metropolitan area.

The plan promotes housing diversity supporting aging-in-place and assisted living and housing suited to households on different incomes, within each neighbourhood and across the city. Specific affordable housing targets are not set in planning policy but potential locations are set out through zoning and neighbourhood plans, with high-density areas requiring affordable housing as part of the housing mixture of housing types. The emphasis is on promoting *missing middle* forms of housing and living affordability.

The Queensland Housing Strategy 2017–2027 provides a framework for key reforms and targeted investment including provision of new social housing. It aims to deliver housing to support urban renewal, generate new jobs, provide affordable housing and drive innovative housing design that responds to contemporary housing needs.

Brisbane's mean housing prices are considerably lower than those of Sydney and Melbourne.

PUBLIC REALM

SCORE: **7.5/10**

Brisbane's subtropical climate and outdoor lifestyle is reflected in the quality of public spaces including South Bank, City Botanical Gardens, Roma Street Parklands, the Riverwalk along Brisbane River, and the bayside parks.

Brisbane City Council (BCC) has developed an implementation plan (the River's Edge Strategy 2013) for a world-class network of river access infrastructure for residents and tourists to enjoy the river. Although high-quality urban spaces are provided in the inner city, many middle and outer suburban areas lack quality spaces for community interaction.

Brisbane's City Plan 2014 and the Buildings that Breathe Guidelines deal with appropriate design of the public realm for the subtropical climate, including shading, zones for deep planting of canopy trees, and semi-outdoor "City Rooms" that provide places for people to meet. Managing the urban heat island effects, especially in future climate scenarios of more days above 35 degrees Celsius, will be particularly important for the future livability of Brisbane and supporting its outdoor lifestyle. Streetscape hierarchy is clearly defined in the Brisbane City Plan and includes subtropical boulevards on key pedestrian routes. Guidance on design quality could be strengthened to ensure the character of this growing city is maintained and enhanced.

URBAN GREEN SPACE

SCORE: **8.5/10**

Brisbane is Australia's most biodiverse city. Inter-Urban Breaks are defined in the ShapingSEQ, which prevents urban coalescence of Brisbane with the Sunshine Coast to the north and the Gold Coast to the south.

Brisbane's livability is defined by its subtropical climate and its setting on the Brisbane River, waterways, Moreton Bay (a Ramsar wetland site of international significance, Moreton Island and Quandamooka Country) and surrounding mountains, forests and reserves.

Green linkages along waterways help catchment management (water quality and ecology) but also provide recreation through walk and cycle ways. Brisbane's growth presents opportunities to improve access and activity along the river and to provide improvements to existing green space.

Brisbane's Infrastructure Plan includes green space as key infrastructure to sustain the economy, the community and the environment. As Brisbane transitions from a suburban to urban form with higher densities, it is critical that it maintains urban green space to support its citizens' lifestyle and the high-quality environment.

The Outdoor Recreation Management Strategy for Brisbane's Natural Areas 2011-2021 ensures outdoor recreation activities within Brisbane's natural areas can continue to meet the demands of a growing community while protecting the values of these areas.

SOCIAL INFRASTRUCTURE

SCORE: **7.0/10**

The Queensland Infrastructure Plan sets out the priorities for infrastructure delivery in Brisbane and SEQ, including investment in schools, hospitals and public transport.

BCC is largely responsible for providing publicly-funded community infrastructure, including community service facilities such as centers, halls and libraries, sport and recreation hubs and art and cultural hubs. The Queensland State Government provides major health and education facilities, major cultural venues including the Gallery of Modern Art, Queensland Museum, State Library, and major sporting facilities. Collaboration is required between the various levels of government, the community and private sector to deliver future infrastructure to support Brisbane's growth.

It is important that Brisbane's growth links planning and infrastructure delivery to prevent *spatial disadvantage*. Decentralized suburban renewal — creating major centers and urban villages — will be important to ensure people have access to services, local employment opportunities, housing and transport choice, irrespective of where they live.

Brisbane's Infrastructure Plan proposes colocating some new principal and district community hubs in the middle and outer areas of Brisbane, which include a mix of arts, community facilities, arts/cultural and library services.

Investment is planned in sports and recreation facilities for these parts of the city. Future expansion is proposed for the Southbank and Brisbane's main cultural precinct.

The state government is planning new health precincts and childcare and education infrastructure to support Brisbane and SEQ's growth. Brisbane's universities are also undergoing masterplanning and expansion to accommodate growth and innovative ways of offering tertiary education.

CLIMATE CHANGE

SCORE: **6.0/10**

Queensland already feels the effects of extreme weather including tropical cyclones, floods, heatwaves and bushfires. The frequency and severity of these events is predicted to increase. SEQ is a *hotspot* for climate change risk because of projected extreme weather — floods, cyclones and storms, drought, heatwaves and rising sea levels — coupled with projected population growth.

Brisbane is built on a floodplain. A large proportion of the Brisbane area is already at risk from flooding or sea level rise and bushfire. It is imperative that future urban development and infrastructure is focused on minimizing these risks.

Natural hazards, risk and resilience are matters of state interest under the Queensland State Planning Policy. Shaping SEQ focuses on disaster risk management planning, adaptation strategies and avoidance of exposure to high-risk areas to minimize vulnerability to climate change impacts. It recognizes that community infrastructure should be located and designed to maintain the required level of functionality during and immediately after a natural hazard event.

Queensland is the highest Greenhouse Gas (GHG) emitting state in Australia and the transition towards low-carbon solutions has been slow. The 2017 Climate Change Transition Strategy sets clear targets for GHG reductions of 30 per cent by 2030 and zero net emissions by 2050. It sets out actions for a range of industries and institutions, but Brisbane is reliant on an energy sector that is dominated by coal without a defined strategy for transition.

BCC achieved carbon-neutral status in line with the Australian Government's National Carbon Offset Standard (NCOS) in 2016 to 2017, making it one of Australia's largest carbon-neutral organizations and one of the nation's largest purchasers of green power.

State and local government town planning mechanisms are not required to meet sustainability performance standards to drive energy efficiency or carbon reductions in the built environment, meaning a default to minimum compliance standards. The Queensland Climate Change Strategy seeks to address this. The Buildings that Breathe Guidelines and the Queensland Smart Design Guidelines point the way on designing for the subtropical climate.

MOBILITY
5.1/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **4.8/10**

Historically, greater focus has been on localized widenings and upgrades to relieve pressure points in the road network.

The need for expansion in public transport infrastructure is now being addressed. The Queensland Government has committed to fully fund the Cross River Rail Project and funding has been provided to support the delivery of Brisbane Metro, which will enhance public transport capacity, travel times and reliability along the length of the South East Busway.

Transport choice and public transport capacity is focused on the Brisbane CBD. Away from the city center, public transport capacity is focused on the limited heavy rail network and busways with a disparate bus network covering suburbs and broader catchments.

Brisbane is not serviced by light rail but a light rail system that links to the heavy rail network has been established on the Gold Coast.

A comprehensive and mostly aligned transport vision is defined in both Connecting SEQ and BCC's Transport Plan for the city. It places a greater emphasis on developing public transport links within and to Brisbane with some rail-oriented projects in the pipeline.

There are no substantial proposals for high-speed rail, but funding has been provided to investigate faster rail between Brisbane and the Sunshine Coast.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **5.0/10**

About 95 per cent of the port's container trade is presently handled by road, making this form of transport a key consideration in the development of current and future land use. Road transport within SEQ presently remains the most effective and cost-efficient mode of transporting export and import containers to and from the port, when compared with rail (over shorter distances).

The Port of Brisbane is the third largest port in Australia and the largest general cargo port in Queensland. In 2002, the Queensland Government constructed the Port of Brisbane Motorway (PoBM) as part of its long-term plan to meet the transport needs of the Port of Brisbane and Australia TradeCoast, and further upgraded the PoBM in 2013 to service growing freight volumes. The Gateway Motorway provides a more direct connection for freight travelling by road to and from the airport.

Given that road congestion in SEQ is predicted to increase, the rail disadvantage could shrink, leading to more long-haul freight moving to rail, particularly where improved rail freight infrastructure and services are provided. The Queensland Government acknowledges the benefits of an inland railway by potentially connecting to the Port of Brisbane. It would support the future national freight task as well as providing a long-term rail solution for exports via the West Moreton Rail System.

Freight routes and curfews have been implemented to reduce disruption.

Dedicated freight routes to avoid commuter train lines are noted in Moving Freight, Transport and Main Roads, December 2013.

GLOBAL CONNECTIVITY

SCORE: **6.0/10**

The government-approved 2014 Airport Master plan developed by the Brisbane Airport Corporation (BAC) guides all development at the airport for the next 20 years, covering passenger growth, job creation and the construction of the new runway, as well as investment in other aviation infrastructure, roads and terminals. In conjunction with the Master plan, BAC also prepared an Airport Environment Strategy and a Ground Transport Plan.

Brisbane's New Runway is recognised as a key driver in the long-term growth of Brisbane and Queensland by creating jobs, opportunities for new destinations and a greater choice of airlines. At a total cost of around CAD1.3 billion, it is the biggest aviation project under construction in Australia and when complete will give Brisbane the most efficient runway system in the country.

By effectively doubling capacity, it will enable continued growth bringing more flights, more choice and better service for all our business and leisure travel.

The Australian and Queensland Governments are funding a joint study for the Port of Brisbane, which focuses on improving rail freight connections to cope with future demand.

A new cruise ship terminal is also being constructed.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **4.8/10**

The Brisbane Active Transport Strategy 2012–2026 outlines targets for mode share by cyclists and walking. It includes plans to develop the commuter cycling network and continue to create a network of high-quality cycle paths with separation from cars and pedestrians in high-use areas. As part of the strategy, Brisbane is looking to complete planning for a Brisbane Bicycle Infrastructure Plan, which will outline the infrastructure requirements of its bikeway network.

The consideration of cycling and pedestrian infrastructure is a prerequisite for all transit and road infrastructure design projects across Brisbane.

Queensland development codes require end-of-trip facilities to be installed for all new major developments and big additions to major developments in designated LGAs. The facilities must be provided in accordance with prescribed workforce or occupant ratios.

The state government does not support shared space, pedestrian priority zones or low-speed zones as a policy position, but, alongside local government agencies, promotes their implementation where appropriate with reduced speed zones introduced in key activity centers, the CBD and school zones. Guidance for shared space is defined in the Manual for Uniform Traffic Control Devices.

BUILT FORM: PARKING PROVISIONS

SCORE: **5.5/10**

BCC recognizes the opportunity to relax parking rates in locations where users have a reduced reliance on personal vehicles. The Brisbane City Plan 2014 describes maximum parking rates for multiple dwellings located within the center or core of Brisbane. Reductions to maximum parking rates are also described for centrally-serviced locations and areas well served by public transport.

Parking reform is being investigated and initiatives such as parking levies and shared parking facilities are being considered.

BCC is actively looking to overhaul the city's planning rules to allow incentives for developers to include car-sharing arrangements in new residential buildings.

Time-of-day priced parking is commonplace across the CBD and in many activity centers around Brisbane.

The council recently undertook a review of parking technology to understand where emerging technology and current infrastructure could be used to deliver better parking outcomes. No firm policy changes have occurred because of this work.

FUTURE MOBILITY: SERVICES

SCORE: **4.5/10**

The state's Connected and Automated Vehicles Initiative is looking to draft policy, support regulation, licensing and possible certification and manage infrastructure technology integration. The state is also looking to understand the potential of this technology and Queensland's role within the industry.

As part of this commitment, the Queensland Government has launched The Future is Electric: Queensland's Electric Vehicle Strategy. A key feature of this strategy is the Queensland Electric Super Highway, the world's longest electric fast-charging highway in a single state.

The Queensland Government in collaboration with local councils and other partners is rolling out the Queensland Electric Super Highway to encourage, support and accelerate the uptake of electric vehicles in Queensland. Eighteen charge stations are being introduced.

The state government has put out a Queensland Drones Strategy consultation paper to start the discussion around how Queenslanders can take advantage of this technology.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

Queensland has introduced a Personalized Transport Register, which allows the public to access details of approved booked hire service licenses and booking entity authorizations for the taxi, ride-booking and limousine industries.

The Q-Portal established by the Department of Transport and Main Roads (TMR) supports free access to state-owned transport data by software developers, promoting innovation and open collaboration with industry.

The Queensland Government is introducing reforms for the personalized transport industry that will promote greater choice for customers, while ensuring safety, accessibility, affordability and accountability for everyone. Following legislative changes implemented in 2017 the government is reviewing the draft framework.

Ride-sharing services such as Uber need to be licensed and pay annual license fees in Queensland.

TMR TransLink division is investigating Demand Responsive Transport (DRT) through an analysis of the supply market and DRT trials that leverage industry and technology to meet community passenger transport needs. Recent trials were completed in the City of Logan.

TECHNOLOGY
7.3/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **8.0/10**

Well-developed physical and digital infrastructure affects productivity directly by connecting economic agents, reducing transaction costs, easing the effects of distance and time, facilitating the flow of information, and facilitating integration of markets into global value chains.

Information and Communication Technologies (ICTs) are becoming increasingly important: there is growing empirical literature on how ICTs facilitate innovation and impact firm and country productivity by giving decision-makers more complete information.

The City of Brisbane's Digital Brisbane strategy outlines how to identify which services and programs should be delivered digitally in future. The creation and publication of this comprehensive document is an important indicator of the maturity of Brisbane's approach to using technology for the betterment of its citizens' lives. Brisbane was the first Australian city, and the second one worldwide, to appoint a Chief Digital Officer and implement a digital transformation strategy for the city.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

Traditionally, wired internet services have been provided via copper wires initially designed to support landlines. Fiber optic cable, capable of supporting much higher bandwidth for multiple users, is replacing copper wires in most countries. It's made from glass and uses light to transmit data over long distances. It is far superior to copper wire and is essential to support both consumers and businesses as we become more dependent on our ability to receive and transmit large volumes of rich media content and information.

Fiber-to-the-Home (FTTH) is superior to Fiber-to-the-Node (FTTN). The latter uses copper wires from the street to the business or home and fiber to the street only. The installation of either version of fiber is a critical element in facilitating digital connectivity.

Under the Australian National Broadband Network, Brisbane, and Australia, is mostly receiving FTTH.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **7.0/10**

Each new generation of cellular technologies has brought greater functionality available in more places with faster access to information. In almost all cases these improvements have been accompanied by decreasing access and usage costs resulting in mobile devices becoming an essential and ubiquitous tool for communications, content digestion and content creation. The evolutionary 5G will give wireless broadband the capacity it needs to power thousands of connected devices that will reach our homes and workplaces.

Narrowband IoT (NB-IoT) is a Low Power Wide Area Network radio technology standard developed to enable a wide range of devices and services to be connected using cellular telecommunications bands. It is the backbone of the Internet of Things (IoT). NB-IoT focuses specifically on indoor coverage, low cost, long battery life, and enabling a multitude of connected devices. The move towards autonomous vehicles and connected infrastructure will make reliable, robust access and connectivity essential.

As more people and devices are being connected and depend on the internet, the complementary wireless technologies of 5G and NB-IoT will become redefined as part and parcel of critical infrastructure.

The availability of Wi-Fi is essential for both personal and business applications. Many cities recognize this and provide free public Wi-Fi access both through commercial providers such as telcos and businesses (such as cafes) as well as by the responsible authority themselves. Regardless of who is providing the free public Wi-Fi, access and availability enables citizens and visitors to easily access a range of services at no cost.

Brisbane City Council provides a free Wi-Fi service.

OPEN DATA

SCORE: **7.0/10**

Open Data is the idea that some data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control.

There is a global movement in developed countries for governments at all levels to make their vast amounts of public data freely available.

This move can facilitate government transparency, accountability and public participation. The opening of official information can also support technological innovation and economic growth by enabling third parties to develop new kinds of digital applications and services.

Open government applications seek to empower citizens, to help small businesses, or to create value in some other positive, constructive way. The City of Brisbane, Queensland Government and the Australian Government all provide open data.

INFORMATION AND DATA SECURITY

SCORE: **8.0/10**

Citizens using services, and especially government services, must have confidence that any information they provide is confidential and stored appropriately, that the system they're using is safe and secure, that they know how their information will be used and that they can easily retrieve any information they provide. If a service cannot guarantee confidentiality, integrity and availability of the system, people will not use it.

The presence of strong legislative and regulatory forms of protection for data security and privacy is essential to sustain confidence and usage of online sites and information. Australia and the Queensland Government have comprehensive security and privacy legislation.

PLANNING AND POLICY

SCORE: **8.0/10**

Brisbane's Digital Strategy provides the overarching framework for digital transformation, guiding the approach that will be taken and articulating the things that need to be considered and achieved to be successful. It recognizes the necessity of robust, reliable secure infrastructure and connectivity to ensure that the vision is possible.

The existence of this strategy together with the political support evident in producing and implementing it is a positive indicator of future readiness.

URBAN SYSTEMS
3.5/10

POWER GENERATION AND DISTRIBUTION

SCORE: **2.0/10**

Like all Australia's east coast cities, Brisbane has been hampered by policy uncertainty over the past decade. The energy grid in Queensland relies on coal-fired power stations, with the Clean Energy Regulator placing Queensland as the highest emitter of CO_2 by volume in 2016 to 2017 in Australia.

Policy uncertainty on climate change mitigation has led to an under-investment in new generation infrastructure to replace ageing power stations, although Australia is well on track to meet its Renewable Energy Target obligations of 33,000GWh by 2020.

The private sector in Queensland has led innovation in the energy sector, particularly with rooftop solar systems.

The BCC's 2017 Plan: Brisbane. Clean. Green. Sustainable, highlights key initiatives for the city. However, it is not linked to comparable benchmarks or have a specific renewable target. There is an opportunity for Brisbane to decarbonize its energy systems and encourage a smart grid that can manage demand, embed high proportions of renewable energy and maintain reliability. Queensland is also addressing clean energy through their Powering Queensland Plan, which includes a target to achieve 50 per cent renewable energy by 2030, to reduce emissions and act on climate change, create new jobs and diversify the state's economy. The state is also looking at new policy around waste, thereby encouraging other forms of energy generation from waste.

WATER TREATMENT AND DISTRIBUTION

SCORE: **5.0/10**

Expenditure in Brisbane over the last decade has been largely driven by a drought leading to low levels in the major water storages. This resulted in CAD8 billion being invested in water infrastructure (desalination, recycled water scheme), with this debt transferred to the bulk water supplier, Seqwater. Several system interconnections to the north and south of Brisbane are strained and need solutions to be planned.

The major water source for Brisbane, the Wivenhoe dam, was initially built as a flood mitigation dam and dam levels are not managed for water security and water quality alone. During the drought, the average water consumption target was 140 L/day/person and the lowest usage recorded was 108 L/day/person. This is considered in the realm of world's best practice usage levels. Since the end of the drought, consumption has increased again to a current usage of 165 L/day/person.

The catchments are rated D+. In the past year, the overall condition of central catchments decreased slightly, ranging from poor to good. High levels of pollutants were generated from extensive urban areas. This will likely increase with continuing urbanization.

Effective erosion and sediment control on construction sites is therefore vital to protect the overall health of waterways into the future. Residents greatly enjoy using the creeks, rivers and Moreton Bay for leisure activities, but the community lacks an emotional connection with waterways and needs motivating to protect them.

Some grazing lands and natural bush/forested areas remain in the upper parts of the catchment but riparian vegetation has been cleared from most waterways. During and after storms a huge volume of stormwater runs off into the waterways.

Key challenges are the management of catchments and improving the catchment quality rating, and dealing with population growth and climate change.

Brisbane's sewerage infrastructure needs big capital expenditure. Queensland Urban Utilities (QUU), which manages the sewerage collection and treatment systems for Brisbane, has a 10-year capital expenditure budget of CAD1.2 billion for sewerage networks, CAD500 million on sewage treatment plants and CAD250 million on water reticulation.

Increases in user charges are not considered a suitable mechanism to recoup these costs so QUU's ability to fully cost recover this infrastructure investment is limited.

Strategic asset management of old infrastructure is the key to the financial management of this capital works budget.

The priorities will be around healthy waterways, river water quality, and minimizing surcharges. Challenges lie in the population growth and urbanization of the population.

WASTE MANAGEMENT

SCORE: **3.5/10**

BCC, like many other metropolitan councils, has looked to include waste management objectives and occasionally initiatives within its long-term strategic plan. The Brisbane. Clean, Green and Sustainable 2017–2031 plan outlines education, diversion from landfill and resource recovery initiatives as the primary waste management goals. Backing the BCC plan is the Queensland Waste Avoidance and Resource Productivity Strategy 2014–2024, which has facilitated mechanisms such as the End of Waste Framework that promote resource reuse across the state.

Although infrastructure investment has been made through the BCC collection contract, most of this provision relates to facility upgrade and future technology review. Limited funding for new infrastructure or improved waste disposal technologies has been made. Funding associated with proposed levy allocation is visible but this relates to Queensland in its entirety, not just BCC.

Limited evidence is available to support strategic waste infrastructure planning or attempts to improve resource recovery via the procurement process.

Landfill remains the dominant waste management solution with significant capacity located outside the city. Collaborative disposal will need to be a consideration for BCC soon with limited new landfill space available within the metropolitan boundary.

Efforts have been made to carve out a waste and resource recovery strategy for Brisbane, although neither the city council nor the state government has made a financial commitment. Consideration of population growth and future waste management service needs are required to cope with the rapidly increasing densification.



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22

Mexico City is the capital of Mexico and the most populous city in North America with 8.8 million residents.

AT A GLANCE

RANKED **22**
CITY SCORE **18.61**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
4.5/10	**4.3/10**	**7.1/10**	**2.8/10**

Together with its urban area (Valle de México metropolitan zone), Mexico City has more than 21 million inhabitants, making it the world's third largest urban agglomeration, the biggest on the American continent, and the most populous Spanish-speaking city on Earth.

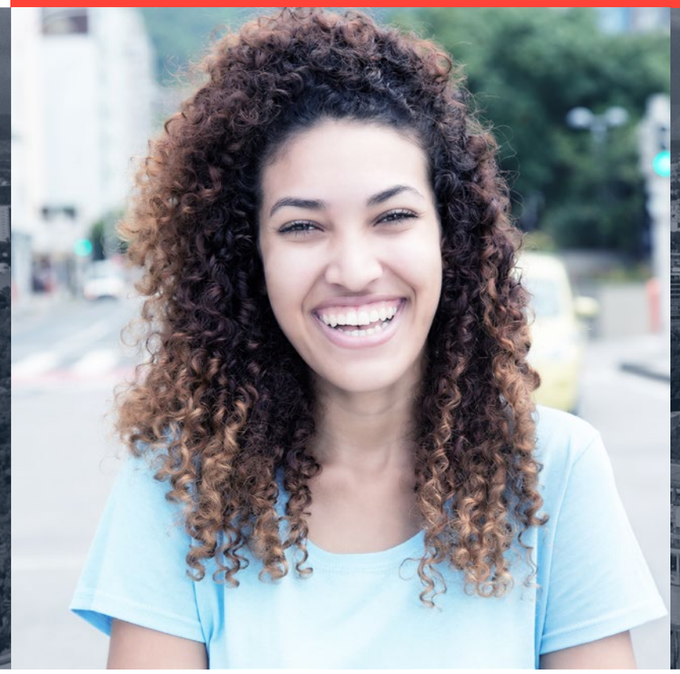
Teeming Mexico City is situated in the Valley of Mexico in the high plateaus of central Mexico, at an altitude of 2,240 meters. The city is divided into 16 districts or boroughs. For the past 28 years, it has been governed by the Center Left PRD.

Mexico City is one of the most important economic centers in Latin America, responsible for about 22 per cent of the country's gross domestic product. It is ranked as the eighth-richest urban agglomeration in the world after Tokyo, New York, Los Angeles, Chicago, Paris, London and Osaka/Kobe.

Many global companies have their Latin American regional headquarters in the city, which is easily the biggest urban nucleus in the country and a political, academic, economic, financial, business, cultural and trend center.

Mexico City is one of the fastest-growing cities in the world with an economy expected to triple in size by 2050.

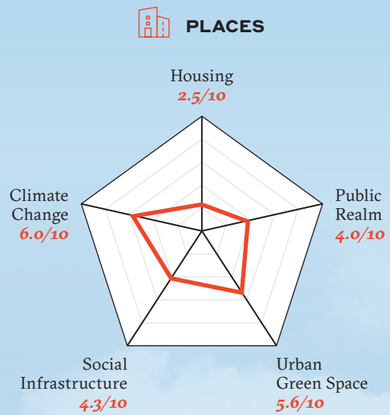


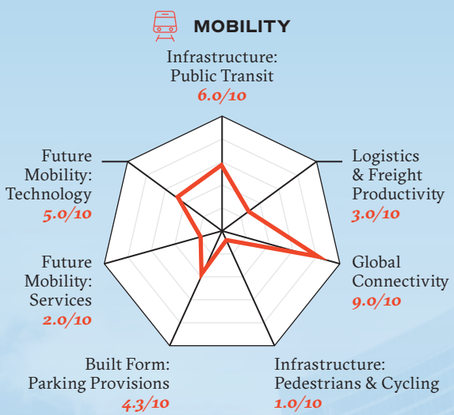


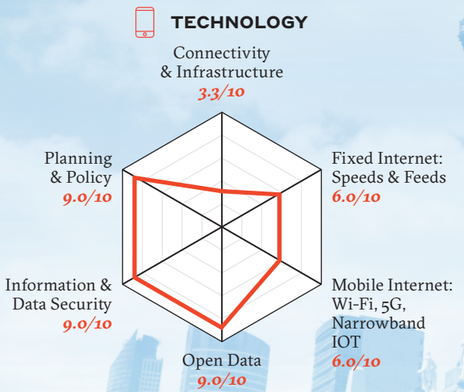


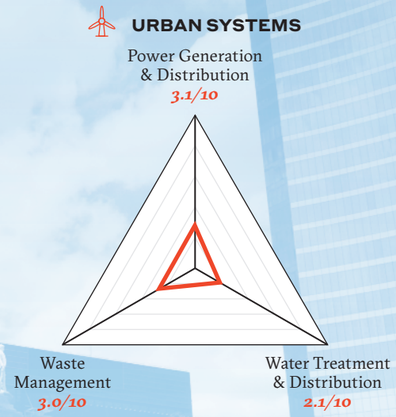
MEXICO CITY

CITY ASSESSMENT









PLACES
4.5/10

HOUSING

SCORE: **2.5/10**

Mexico City has grown so fast that the government has not been able to keep up with housing and services. Many houses were thrown up quickly without the proper foundations, hence the sprawling slums, called barrios, surrounding the city. These barrios lack access to fresh water, do not have proper sewage outlets, and in many areas, do not have electricity. This contributes to an unhealthy population and damages the environment. Outside the barrios, many areas flourished because of the city's economic growth. In some areas, wealthy citizens live gated-off from the outside world.

In 2001, Mexico City introduced a set of policy guidelines called Bando Dos to deal with the city's housing problem by encouraging densification in inner areas. Bando Dos divided the city into the four central boroughs and put a cap on construction of new houses in any of the other areas of Mexico City. More than 224,000 people moved into the boroughs between 2005 and 2006 and today more than 60 per cent of Mexico City's residents live in them. Many old and poorly constructed houses were knocked down to make way for the new and improved housing. Bando Dos also attempted to help with the sewage, electricity and water problems, yet much uncertified housing and construction continues.

The problems fueling Mexico City's housing crisis are manifold. Low-income households have little access to loans. The cost of almost all property in the capital is high and there is little social housing. Loans available to low-income families are usually for places outside the capital, given that housing is less expensive in nearby states. "This means that there is a permanent and accumulative housing crisis," analyzes the Housing Institute for Mexico City.

Looking ahead, there are virtually no new plans for developing housing. But some more organized development might be in the offing given that recently elected president Andres Manuel Lopez Obrador, who takes office on 1 December 2018, is from the same Leftist political party as the governor of Mexico City.

The Ministry of Urban Development and Housing (SEDUVI) has various instruments for Mexico City planning and its management.

The programs and regulations on which SEDUVI is based are continuously updated to guide urban development, according to the dynamics, transformations and needs that affect land use.

It also has the Sustainable Development Council, made up of specialists, consultants, academics and officials who contribute to the continuous review of these instruments.

PUBLIC REALM

SCORE: **4.0/10**

Mobility and urban infrastructure in Mexico City leaves much to be desired. Mexico City needs to improve the transport of people and generate strategies that will advance tourism.

Some of the more obvious improvements needed for public space in the capital are maintenance of pedestrian crossings, the installation of lighting and the maintenance of urban street furniture to cater for tourists and citizens alike.

There is a tremendous opportunity to recover the public realm by creating and strengthening local/historic communities and landmarks within the city. One way of helping would be for districts to have walking corridors and bike lanes. Crossing the denser part of the city is only 22 kilometers in a straight line. Walking and bike lanes could also help to reduce congestion, noise and air pollution in an area where the average speed of a car is 13 km/hr, marginally faster than bike-lane speed.

URBAN GREEN SPACE

SCORE: **5.6/10**

While Mexico City is infamous for being an asphalt jungle, 59 per cent of the city's area is conservation land. However, the official designation has not stopped illegal logging and urban sprawl further each year from cutting into the stands of pine and oyamel trees and grasslands that sprawl across southern Mexico City.

Throughout the city it is possible to find other smaller green areas such as gardens. Like the large forests, the gardens and other green areas absorb pollutants, muffle noise, allow rainwater to recharge aquifers and, above all, balance the environments important for urban spaces.

Green areas also play an important part in recreation through their use for cultural, sports and social activities, as well as reinforcing the identity of neighbourhoods. In all the city neighbourhoods there is a park or garden, spaces that help raise the quality of life.

Efforts have been made to recover residual spaces. This has been done as part of a new concept, in which the environmental benefits of urban green areas are integrated with a recreational, health and social inclusion approach.

Pocket spaces also are being given attention, so they become places of coexistence and recreational and cultural exchange as well helping the environment. Most are within easy walking distance of communities.

Apart from the maintenance and development of traditional green urban areas, Mexico City has plans to soften the effect of some major roads. One example is the Via Verde project in which columns of the second level of a major road in Mexico are being converted into vertical gardens to clean more air and make the roads more aesthetic.

SOCIAL INFRASTRUCTURE

SCORE: **4.3/10**

The Contribution Fund for Social Infrastructure finances work and basic social actions and investments that directly benefit people living in extreme poverty or in locations with a high or very high level of social backwardness.

The Ministry of Social Development distributes the money from the fund among the states and Mexico City. Distribution is determined by a formula that considers the number of deprived people living in vulnerable conditions, with the goal of helping to alleviate these conditions.

Mexico City is also the capital of culture. It is home to 185 museums for visitors to enjoy fine art, other beautiful collections, archeology and history. There is also a variety of libraries.

In December 2017, there were 428 clinics in Mexico City, which include health centers, clinics, communities for adolescents, pediatric clinics and maternity clinics.

A year ago, the Government of Mexico City announced it would invest CAD21 million in infrastructure for public schools.

CLIMATE CHANGE

SCORE: **6.0/10**

Mindful of the dangers of extreme weather, the Mexico City Government published The Vision of the City of Mexico on Climate Change to 2025, which proposes action aimed at sustainable development through the reduction of emissions of compounds and greenhouse gases, and the increase of resilience to climate change. The objective is to reduce the 31.4 million tons of cumulative carbon dioxide equivalent, as well as increase the adaptive and resilience capacities of the 8.8 million people living in the city area. It is all based on the seven strategies of the Climate Action Program of Mexico City 2014-2020.

These goals, which are translated into mitigation, adaptation and resilience-building, are included in the 102 actions that make up the vision of the city on climate change in 2025, as well as a panoramic view of the phenomenon from where the sources generating compounds and greenhouse gases stand out.
These sources generate high concentrations of pollutants in the atmosphere, which, in turn, adversely affect health and can cause big economic losses.
Many of the infectious diseases that humans suffer are transmitted by bacteria and viruses that will find climate change propitious. On the other hand, the recharge of aquifers decreases with the lack of rain and, therefore, the availability of water could be problematic.

At the national and local level, climate change is recognized as a serious threat to humanity, ecosystems and biodiversity. This threat demands an urgent response from all nations and cities to diminish its effects. At the international level, Mexico City has also expressed its willingness to reduce the negative impact of its activities on the planet. Within Mexico, it is a pioneer in addressing this problem.

The global organization C40 ranked Mexico City first in Latin America in the category of Cities with the Best Performance in actions implemented against climate change in 2017.

Vehicles represent a major source of air pollution, propelled, as most of them are, by the combustion of hydrocarbons (mopeds, cars and trucks). Emissions from the exhaust of these vehicles contain carbon monoxide, hydrocarbons and nitrogen oxides that are released into the atmosphere in significant quantities. They are the components of the photochemical oxidative smog. The most populated urban areas suffer the greatest contamination of this type. The air pollution has harmful effects for human health, according to epidemiological studies.

Vehicles are the most important sources of air pollutants in Mexico City and the Ministry of the Environment is charged with ensuring that the city's vehicles have the lowest possible emission of pollutants. One measure is checking the efficiency of catalytic converters and, if they are not up to scratch, putting cars off the road for a certain number of days a month.

Mexico City also has in place some adaptation and mitigation measures for climate change, such as a 20 per cent reduction on property tax if a homeowner installs solar panels.

MOBILITY
4.3/10

INFRASTRUCTURE: PUBLIC TRANSIT AND CYCLING

SCORE: **6.0/10**

Public infrastructure developments, as well as the urban furniture maintenance and the provision of services to the people, are the priorities for the Ministry of Works and Services. It will look for strategies of financing to give continuity or to start with the visualized projects.

In addition, it has a priority to develop infrastructure for public transport, with the vision of benefiting not only the nine million inhabitants of the capital, but also the five million people that represent the city's floating population. Projects include the extension of Line 5 and the construction of Line 7 of Metrobús; the extension of Lines 9 and 12 of the Collective Transport System; and the third section of the Interurban Train Mexico-Toluca.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **3.0/10**

Last year the Government of Mexico City supported 230 small and medium enterprises through a program with the objective of improving the competence of the workforce and managers as well as increasing productivity, conservation and generation of employment together with improving conditions. The beneficiary companies were 58 per cent in services, 26 per cent in commerce and 16 per cent in the industrial sector. In addition, there was a 53 per cent increase in units attended compared with 2016.

Ports, such as Tuxpan, the closest to Mexico City, have been expanded because they are the conduit for 80 per cent of merchandise.

Mexico City has virtually no plans for the development in logistics and freight since most of these operations are managed in the neighbouring states. The metropolis is clogged with traffic without more being introduced. It has grown in a way that distribution centers and logistical operations have been moved to the limits of the city and the neighbouring states of Estado de Mexico, Puebla, Morelos and Queretaro.

GLOBAL CONNECTIVITY

SCORE: **9.0/10**

The new International Mexico City Airport under construction will be six times bigger than the current airport. It is the most important infrastructure work in the country, which, in addition to becoming a center of world-class operations, will be the most important generator of jobs in Latin America.

Even the old airport has the most traffic in Latin America; it is used by 30 airlines, of which 23 are international, flying to more than 50 destinations. Last year international passenger traffic rose 10.3 per cent, closely followed by domestic at 8.5 per cent. In the past five years passenger traffic through Mexico City grew by 9 per cent compared with 4.3 per cent globally.

Consumption of water at the new airport is expected to be 79 per cent lower. It will use captured rainwater, some of it through the columns of the terminal, and 100 per cent of wastewater will be treated.

The new airport will have three runways in its first stage and its location is expected to reduce noise in Mexico City. More than 17 communication infrastructure projects are in progress around the new terminal, which will strengthen connection and mobility in the Valley of Mexico.

It will be opened in stages, beginning in 2020.

PEDESTRIANS AND CYCLING

SCORE: **1.0/10**

The Government of Mexico City is working on a business mobility program so that work centers with more than 250 employees use high capacity trucks or shared cars for the transfer of personnel. It is also promoting recreational activities that encourage the use of bicycles.

At present the ECOBICI bike-share polygon covers 4.2 kilometers in 19 neighbourhoods that account for 60 per cent of the bicycle trips in Mexico City. It has been operational since 2010.

About 90,000 ECOBICI users have made 9.1 million trips. On average, 20,000 trips are made daily. Mexico City has the lowest rates of vandalism, accidents and robberies worldwide, with 35 accidents per million trips.

BUILT FORM: PARKING AND PROVISIONS

SCORE: **4.3/10**

The Government of Mexico City is working on a radical proposal to reform the parking regulations in a bid to discourage the use of cars. It is considering making the minimum number of parking spaces required in a building the maximum, so that new projects might choose not to consider parking spaces.

If projects choose to build parking spaces, they must pay an amount to the city as a mitigation measure for urban impact. The proximity of buildings to public transport systems will also be a factor in the calculation of contributions to a mobility fund.

The change to parking regulations represents a paradigm shift in city mobility towards public transport.

FUTURE MOBILITY: SERVICES

SCORE: **2.0/10**

A new mobility system, Calles CDMX, has been presented to develop comprehensive mobility programs, road safety, technical standards of accessibility, a cycling infrastructure guide, manual of sidewalks and public space. This system also includes guidelines for the design and implementation of public parks, street guidance, road safety auditing guidelines and the manual of traffic control devices, among other instruments.

This system summarizes all the infrastructure implementation that the city has had with its technical teams over the years. Its purpose is to change the streets to improve mobility and safety.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

A new governing model emerged in 2014 with the enactment of the new Mexico City Mobility Law that focuses on building a culture of sustainable active transport to reserve Mexico City's history of urban sprawl. There is lot of progress to be made, and city leaders have ambitious plans to turn Mexico City into an example of innovation in people-oriented, sustainable mobility.

Future plans also incorporate development of electric and hybrid vehicles, introduction of self-driving vehicles and a regulatory framework that brings together a high-quality mobility ecosystem that is well connected and sustainable. The leaders recognize that implementation of such technology is also disruptive and integrated actions need to be taken with precaution at every step.

TECHNOLOGY
7.1/10

Some of the metrics do not include a narrative as written information was not available from the respective agencies.

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **3.3/10**

To take advantage of existing infrastructure, the Mexico City Government has initiated the CDMX Connectivity Masterplan project in cooperation with the National Autonomous University of Mexico and the World Bank.

The project aims to increase the connectivity of the Mexico City through an organizational unit responsible for the management of infrastructure and the design of a public-private partnership. It will take a lead from international experience to operate the Mexico City Connectivity Network in a way that makes efficient use of existing infrastructure and promotes synergies and sustainable growth of new infrastructure to lay the foundations for Mexico to become a Smart City.

The Government of Mexico City has set its sights on the development of an intelligent city. It will:

- Provide solutions to the problems of urban areas
- Take advantage of technology to simplify people's lives and facilitate the activities of companies
- Leverage new tools based on collective intelligence and collaborative social processes.

The promotion of the development of the technological infrastructure will be coordinated by the Economic and Social Council of Mexico City, which will collaborate with the academia and business.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **6.0/10**

Last year the number of internet users in Mexico increased by almost six million, from 65.5 million in 2016 to 71.3 million. Smartphone use is also expanding, not quite as rapidly; the number of users was up from 60.6 million to 64.7 million.

However, there is a big digital divide. In urban areas, 71.2 per cent of the population aged six or more are internet users compared with only 39.2 per cent in rural areas. Overall, 64 per cent of the population aged six or more are internet users, which reflects a growing penetration from the 59.5 per cent of 2016 and 57.4 per cent of 2015.

Thanks to changes in legislation, the market has opened for providers, some of whom are investing in infrastructure to increase their reach. Competition in the market means prices are dropping and more informed consumers are looking for better options. Connectivity is expected to continue increasing without intervention from the city authorities.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **6.0/10**

Mexico has one of the highest internet speeds in North America. However, it lacks the high speeds in the mobile internet category. Significant efforts are being made to improve market competition and reduce the monopolistic environment. This will eventually help to bring prices down.

Mexico is mirroring the global trend towards mobility and heavy investments have been made in cloud analytics services. In the recent future, this sub-sector is expected to experience huge growth. Some 84 per cent of Mexican companies, in 2016, shifted to the cloud, mostly under a hybrid model. The app market is flourishing with heavy internet usage and many brick and mortar retailers are ramping up their eCommerce divisions.

The government has made heavy investments in Internet of Things (IoT) technologies and concentrated on smart cities and smart grid technologies. Being driven by the strong industrial sector, which has also made huge investments in IoT solutions, Mexico has adopted IoT well.

Internet-based policies and regulations on issues such as privacy, net neutrality, server localization, and intellectual property are in the process of being defined. Practices such as zero-rating are common place.

OPEN DATA

SCORE: **9.0/10**

The Law of Transparency, Access to Public Information and Accountability of Mexico City states that all the information generated, administered or in possession of the obligated subjects is public and must be accessible to any person.

This law establishes disclosure on the internet of information defined as transparency obligations, understood as being of general interest and not the result of an express request.

This information should be updated at least every three months, and be truthful, reliable, timely, free, consistent, comprehensive, accessible, understandable and verifiable.

The right of access is to public information held by any authority, entity, organ and body of the executive, legislative and judicial power, autonomous bodies, political administrative organs, city halls and/or territorial demarcations, parastatal organizations, public universities, political parties, trade unions, trusts and public funds, as well as any natural or legal person that receives and exercises public resources, acts of authority or public interest in Mexico City.



INFORMATION AND DATA SECURITY

SCORE: **9.0/10**

Cybersecurity, sustainability and resilience are crucial for Mexico's safekeeping as well as its social and economic development, especially when it ranks as the second country in Latin America with the most cyberattacks. With more than half of the country's population using the internet, cybersecurity is an important area for the government.

The Government of Mexico does not have specific legislation in place for cybersecurity, but it is included in the Federal Criminal Code, mostly regarding financial crimes, information security, and the use of technology in other crimes, such as terrorism, kidnapping, and drug trafficking.

Mexico has a Specialized Information Security Committee, which was tasked to create a National Strategy for cybersecurity. However, this has not yet happened and the Federal Police currently handles issues on a case-by-case basis through its Cyber Police and Scientific Division.

The city has established the National Institute of Transparency, Access to Information and Protection of Personal Data to protect information transparency and data monitoring. This keeps a check on government actions and provides information to any individual that requests a copy of their personal data.

PLANNING AND POLICY

SCORE: **9.0/10**

URBAN SYSTEMS
2.8/10

POWER GENERATION AND DISTRIBUTION

SCORE: **3.1/10**

The Government of Mexico City promotes energy efficiency projects that benefit the people, such as the installation of solar panels in the city's main wholesale market for produce and the use of electricity from renewable sources in 2,000 shops.

Because of the creation of the Office for the Promotion of Investment for Energy Sustainability (OFISECDMX), the government will support those businesses that traditionally consume energy, such as laundries, by providing clean energy.

OFISECDMX will seek to identify relevant projects for Mexico City, multiplying the energy economy and deploying a strategy for the private sector to encourage investment in the renewable economy.

In at least one area Mexico City has already reached for a leading-edge solution. It is building a thermovalorization plant, which uses heat to decompose organic waste and, with the steam produced, generate electrical energy. The remaining waste from the incineration can be used in the construction industry.

The thermovalorization plant will produce electricity for 12 Metro stations from burning the 4,500 tons of the 13,000 tons of waste generated by the city each day.

Although Mexico has made encouraging noises about giving its citizens access to cheaper electricity, the new energy market has run into problems. Further progress might have to wait until the new national government takes office later this year.

WATER TREATMENT AND DISTRIBUTION

SCORE: **2.1/10**

Between 2009 and 2014, the national water authority, Conagua, invested almost CAD840 million in water treatment in the country. In Mexico City, there are 95 treatment plants, 70 of them public. Of those, 20 per cent work inefficiently and most of them have exceeded the lifespan for which they were designed.

Another factor to consider is that Conagua, Sacmex and CAEM do not comply with the transparency obligations imposed by the law, so they do not provide complete information on the construction and operation of the treatment plants.

WASTE MANAGEMENT

SCORE: **3.0/10**

The policy of the Government of Mexico City is aimed at the prevention and minimization of solid waste through processes that reduce its quantity in each of its stages: generation, storage, collection, treatment and adequate disposal. In addition, it has an updated regulatory framework and institutional coordination of the administrative areas involved, under a supervision and surveillance scheme.

As such, short-term problems will be tackled by the city but the long-term objective is for the city to recycle a large percentage of its waste. It hopes to foster a citizen culture that contributes to the reduction and reuse of the materials consumed each day and encourage a sense of shared responsibility in the service sector and commerce more broadly.

Cutting waste is hardly at the top of politicians' agendas but sometimes messages hit home. One such example has been the aggressive advertising campaign run by the Department of Natural Resources and Environment, in which it informed the public of the environmental consequences of using plastic straws. A huge beverage company said that it will introduce packages that don't need straws anymore.

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23





NEW DELHI

Beating strongly as the heart of India, Delhi is officially known as the National Capital Territory (NCT). Categorized as a union territory of India, Delhi comprises 11 districts, one of which is New Delhi, the official capital.

AT A GLANCE

RANKED **23**
CITY SCORE **17.50**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
4.3/10	**4.8/10**	**4.7/10**	**3.8/10**

While New Delhi and Delhi are often used interchangeably to refer to the modern city, we use *Delhi* as the urban agglomeration for the purposes of this assessment. The NCT includes both old and new Delhi, the surrounding metropolitan region, together with rural areas.

Rich with heritage and culture, Delhi stands on the west bank of the Yamuna River and in the north-central part of India. Inhabited since the sixth century BC, the city has been home to several kingdoms and empires and boasts an eclectic mix of ancient ruins, old monuments, British-influenced settlements and modern buildings.

As the commercial, transport, cultural and political hub of the country, Delhi has an economy driven by the service sector with the bulk of the population engaged in manufacturing, trade, finance, public administration and various other services.

Like many other large cities, Delhi is suffering from the effects of rapid urbanization, including pollution, traffic congestion and scarcity of resources as well as the proliferation of uncontrolled settlements.

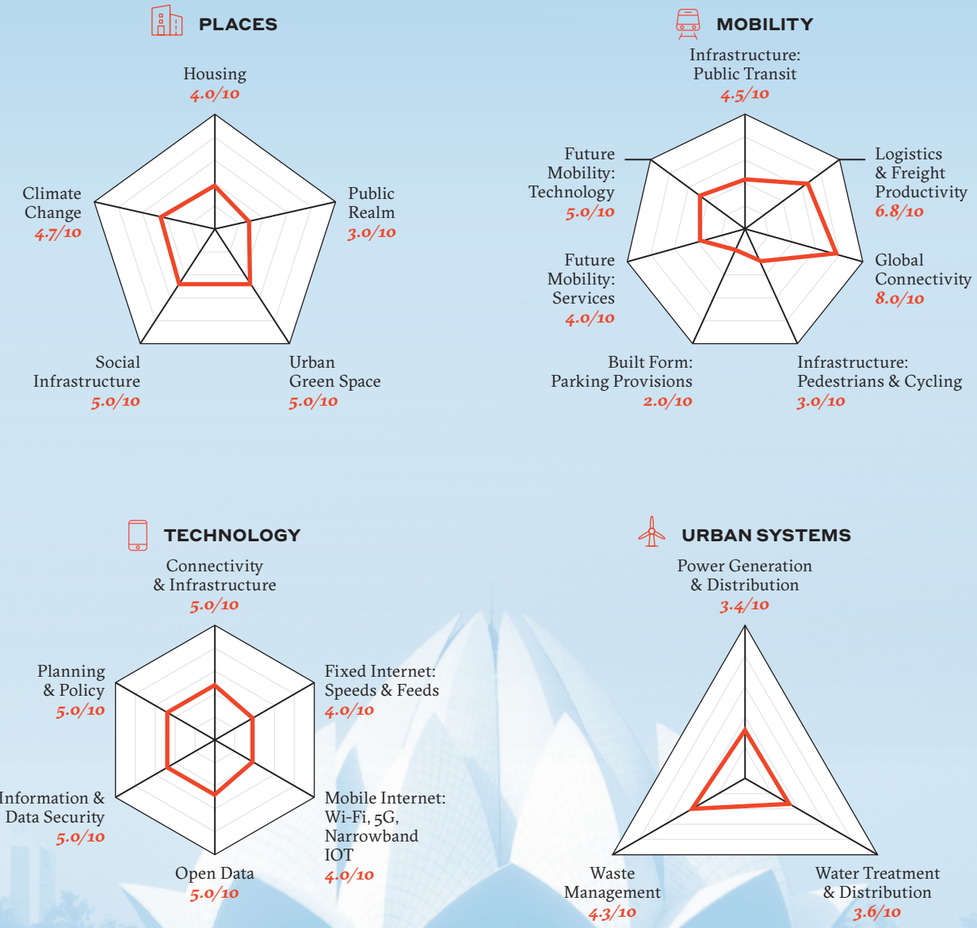
Housing the growing population and keeping pollution levels under control are some of the biggest challenges authorities face.

While infrastructure has improved over the years, demand for transport, drinking water, sanitation, waste and electricity is high. It will require a significant growth in spending, particularly if the city wants to capitalize on the potential of economic growth.

Delhi is well-connected with a mixture of roads, highways, bus services, metro, taxis and aviation as well as auto-cycles and e-rickshaws. While modernization and expansion have been taking place, further efforts are needed to improve inter-modality, particularly through widespread adoption of technology solutions. For example, the government is looking at applying artificial intelligence to driverless trains, precision irrigation, remote sensing and medical diagnosis.

Can Delhi overcome its history of inadequate infrastructure, power shortages and pollution to become a mega-city of the future where the community can thrive – economically, socially and environmentally?

CITY ASSESSMENT



PLACES
4.3/10

HOUSING

SCORE: **4.0/10**

Delhi is the fifth most populous city in the world and the second-biggest in India. It is in line for substantial assistance from the Government of India through its Smart Cities Mission, set up in 2015. All mission cities are expected to formulate a City Development Plan that outlines a vision for development and strategies for achieving it as well as indicative investment requirements and financial operating plans.

Previous schemes such as Valmiki Ambedkar Awas Yojana 2001, Jawaharlal Nehru National Urban Renewal Mission 2005 and Rajiv Awas Yojana 2011 failed to meet the demands of affordable housing.

In 2015, the government announced the Housing for All by 2022/Pradhan Mantri Awas Yojana scheme targeting the building of 20 million affordable homes across the nation. As of 31 July 2017, only about 2.4 million houses had been approved and about 1.2 million built.

The Confederation of Real Estate Developers' Associations of India is planning to launch 250 affordable housing projects across India through its members.

The Delhi Masterplan 2021 has a vision of the city becoming world-class, but 2.4 million new homes will be needed by then to accommodate the projected population of 23 million.

To cater to the homeless, shelters and rest areas are proposed near railway terminals, bus terminals, wholesale/retail markets, freight complexes and so on. Authorities are planning resettlement colonies, rehabilitation of slums and regularization of unauthorized colonies.

In the recent land-pooling policy from the Delhi Development Authority, the government said that it would notify 89 villages as development areas. This will unlock 20,000 to 25,000 hectares of land across Delhi, mostly in urban villages and smaller towns at the city's peripheries, for real estate development.

The Delhi Urban Shelter Improvement Board (DUSIB) oversees the operation and management of night shelters. A total of 198 night shelters are being operated by non-governmental organizations (NGOs) in permanent buildings, Porta Cabins, tents and government units.

People are provided with a heavy cotton rug, blankets, water, toilets and electricity, all in a covered and enclosed structure. Average occupancy is close to 50 per cent.

The NGOs are:

- Paid by DUSIB to provide three caretakers and three helpers around the clock to operate the night shelters
- Required to keep them clean, manage entry, keep records of occupancy and report problems to DUSIB
- Charged with motivating people sleeping in the open to move to night shelters.

PUBLIC REALM

SCORE: **3.0/10**

Due to so much traffic of all types on the roads, travel by bicycle and rickshaws is very risky, although it provides work for many of the unskilled workers residing in the city.

In the past six years, at least 10,000 people, more than 40 per cent of them being pedestrians, have died in road accidents in Delhi. In 2016, there were 6,830 crashes out of which 1,415 people were killed. Of the 1,415 deaths, 600 were pedestrians and 550 were cyclists. The city is crying out for the segregated cycle ways to facilitate the movement of non-motorized users.

With the phenomenal increase in personal motor vehicles, finding parking space is full of problems. Parking in defined spaces is commonly ignored, resulting in congestion and a seemingly chaotic public realm.

Blockage of the drainage network is concerning. It is mainly because of encroachment by slum dwellers, which causes choking of drains and flooding in the upstream areas because of reduced carrying capacity. The other major reason is dumping of solid waste in the drains.

Delhi Master plan 2021 caters for the design, location and maintenance of foot bridges, improvement of road engineering, subways, multilevel parking and control of vehicle registrations. Major work centers, where a multitude of pedestrian networks emerge and culminate, have been planned to enhance facilities for the pedestrians. To improve the situation for pedestrians, cyclists and two-wheeler riders, an approach is needed that includes strict enforcement, improving road engineering and awareness, drives on traffic violations and observing road discipline.

Rejuvenation of the Yamuna River is a challenge for the civic bodies. Many schemes and policies have been framed to clean up waterfront areas with little result.

URBAN GREEN SPACE

SCORE: **5.0/10**

Global standards mandate at least 20 square meters of open or green spaces per urban resident to ensure good quality of life. Delhi has 22 square meters per capita of open spaces, but the government is making efforts to make the green spaces more adequate.

In April 2018, a new 36-hectare city park, adjacent to Humayun's Tomb in Nizamuddin, was opened. The park, which features several renovated world heritage monuments, houses Delhi's first arboretum (a garden of trees) and has displays of species native to the national capital (80 birds and 36 butterflies) and a bonsai house.

For the first time, in 2018 to 2019, the government has come out with a Green Budget to address pollution in Delhi. Civic agencies planted half a million seedlings on road islands and edges in the second half of 2017 and hundreds of thousands more early 2018. Three hundred seedlings from forest nurseries were distributed free to citizens for planting in their own backyards. These efforts have paid a dividend — forest and tree cover in Delhi increased from 299.77 km² in 2015 to 305.41 km² in 2017.

SOCIAL INFRASTRUCTURE

SCORE: **5.0/10**

The education sector was given the biggest allocation (26 per cent) in the 2018-19 Delhi Budget. Spending is being concentrated on constructing more classrooms and other school buildings, playgrounds and clean toilet facilities.

The government had planned to build 12,748 additional classrooms and 30 new school buildings and set up nursery classes in 366 Sarvodaya Vidyalayas. Pre-primary classes have already been started in 155 Sarvodaya schools. A commerce stream has been added in 144 schools.

To promote safety and security of students and to ensure proper monitoring of school activities, about 100,000 CCTV cameras will be installed in government school buildings for which an outlay of CAD340 million has been proposed in the 2018-19 budget estimates. About 150 to 200 cameras will be installed in each school.

The private sector has played a significant role in enhancing education for those who can afford the high institutional fees. However, government institutions need to step up to provide affordable and quality education. The availability of land could become a constraining factor and one way forward might be to permit educational institutions to operate two shifts.

In the private sector, the points system for nursery admissions is a big obstacle for parents. Delhi has 1,700 private schools that offer about 100,000 nursery places but four times as many children are seeking admission, according to estimates.

The Delhi Government had plans to build 1,000 neighbourhood clinics, which has earned praise for filling the gap in primary healthcare. However, because of administrative hurdles in acquiring land, only 164 clinics are functional. A sum of CAD770 million was set aside in the 2018-19 budget for setting up neighbourhood clinics and polyclinics.

Delhi is a historic city, with ancient remnants scattered everywhere. However, heritage in the city suffers from a lack of integration with the planning process and contemporary needs. Much of it is gradually being degraded and lost. Heritage zones and archaeological parks have been identified and individual conservation plans formulated by local bodies and land-owning agencies.

CLIMATE CHANGE

SCORE: **4.7/10**

According to a recent World Health Organization report, 14 Indian cities are among the world's 20 most polluted. India's capital, Delhi, is in sixth spot.

Crop stubble burning caused a quarter of the air pollution that blanketed Delhi in November last year. The particles from the stubble burning combine with industrial pollution, vehicle exhaust fumes and dust to cover the region every year as winter approaches and wind speeds drop.

The Delhi Government has taken many initiatives, among them setting up a model for the forecasting of air pollution, subsidies to switch over from diesel generator sets to cleaner technologies, buying 1,000 fully electric buses and introducing 905 electric feeder vehicles. Delhi is the only city in India that has an Air Ambience Fund to promote green transport usage, which has also been used to bolster the odd-even number plate experiment to limit the numbers of cars on the road.

The setting up of the National Green Tribunal (NGT) in 2010 was a landmark for the environmental movement in India. The aim of the NGT is the effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages. It is a specialized body with the necessary expertise to handle environmental disputes involving multidisciplinary issues.

The city does address a broader resilience strategy that will manage the social and economic impacts of climate disruptions.

MOBILITY
4.8/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **4.5/10**

Delhi has undergone massive changes in public transport in the past two decades, since the Delhi Metro began operating at the end of 2002. At 277 kilometers, it is the longest metro in India and eleventh longest in the world with sixteenth highest ridership. The system provides good connectivity within the city and the neighbouring satellite towns and cities: Noida, Gurugram (previously Gurgaon), Ghaziabad and Faridabad, with construction underway to connect Greater Noida.

Traditionally, public transport in Delhi was the responsibility of Delhi Transport Corporation (DTC), which was incorporated in 1948. Over the years various schemes were developed to support the ever-increasing demand for public transport, including private operators under State Transport Permits. Lack of proper management, funding and coordination gave buses a reputation for unreliability, which ultimately led to spiraling private vehicle ownership. Limited bus connectivity between Delhi and its satellites also contributed to growing dependence on private modes of traffic. Although there has been a recent push to improve the bus service within the city, it is weighed down by an aging fleet, with about 10 per cent of buses not available due to breakdowns. The fleet is about a third of the size required.

DTC recognizes the need to replenish the fleet and has discussed with the government to not only buy new buses (1,000 on priority) but also add new routes (or improve services on some routes). The plan for the growth and development of the system still needs to be put into action.

Lack of adequate public transport (door-to-door connectivity) has also led to a proliferation of Integrated Public Transport modes like auto-rickshaws, e-rickshaws and cycle-rickshaws. Although these provide an invaluable service to the system, driving behavior is not always conducive to the traffic mix, often resulting in congestion and poor flow of traffic.

Transport has been recognized as a major part in the masterplan prepared for Delhi, which identifies key transport hubs, plans and depots and their spread through the city based on demand analysis done by various government bodies and private consultants.

Despite the introduction of the Metro and its high ridership and various other plans to enhance public transport in the city, public transport usage has dropped sharply and private vehicles are taking over.

At present, there are a couple of metro and bus interchanges within the city and several multimodal transport interchanges are being planned at strategic locations in the city, to integrate metro, rail and the airport.

LOGISTICS AND FREIGHT PRODUCTIVITY

SCORE: **6.8/10**

Delhi is not only the main administrative and political center of India but it is also a major industrial hub. Increased commercial and industrial activity in the city drives economic growth in the country. The logistic sector in Delhi has been in transformation mode because of growth in industry and infrastructure construction.

Delhi is landlocked with the nearest seaport about 1,200 kilometers away. Freight comes in and leaves Delhi mainly through a few dry ports/Inland Container Depots (ICD) on the outer boundary of the city. These dry ports/ICDs are well connected by rail and road networks to other parts of the country and major seaports such as Jawaharlal Nehru Port Trust in Mumbai and Mundra Port in Gujarat. However, existing trunk rail routes such as Howrah-Delhi in the eastern corridor and Mumbai-Delhi in the western corridor are saturated and line-capacity utilization varies between 115 per cent and 150 per cent because of the huge number of passenger trains.

In the past 25 years, the railway has lost more than half its revenue-generating freight traffic on these routes.

National highways connecting Delhi are becoming more congested because of this freight shift from rail to road. The surging industrialization, power needs and booming infrastructure construction in the Delhi region led the government to start developing western and eastern dedicated freight corridors.

The corridors should greatly reduce the freight transportation time from Delhi to eastern and western parts of India and reduce congestion on the national highway network. The western corridor will connect Delhi with major container ports on the west coast and the eastern corridor will connect Delhi with eastern coalfields and steel manufacturing hubs.

The decongestion will reduce the environmental pollution and accidents. Some multimodal logistic hubs are planned along the corridors in and around Delhi by the Delhi Mumbai Industrial Development Corporation.

The Indira Gandhi International Airport in Delhi is the biggest airport in India for both passenger and freight movement. A total of 963,000 tons of freight cargo was handled at the airport in 2017 to 2018.

GLOBAL CONNECTIVITY

SCORE: **8.0/10**

Delhi Airport is the sole international airport in the city and can be accessed via three terminals, with three more planned in the Delhi International Airport Limited (DIAL) Master plan 2016. It is the busiest airport in the country (and eighth in the world) with 50 million passenger movements a year and more than 1,185 flights per day. Over the years, it has been ranked within the top three airports in the world on several occasions.

Given the strategic importance and the ever-increasing load on Delhi Airport, plans are afoot for a new airport in Jewar (near Greater Noida) to ease the burden on existing infrastructure and provide more options to passengers. To be built on 5,000 hectares and have the capacity for six million passengers a year initially, it will add a new dimension to the connectivity that Delhi and the NCT enjoys with the rest of the country and world.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **3.0/10**

Cycling isn't big in Delhi and for the most part it has poorly designed pedestrian pathways. In recent years various proposals have been developed and some pedestrian improvement schemes have been implemented in the city center. For the most part, the cycle lanes are either poorly designed or there is limited to no enforcement to avoid encroachment by mechanized transport or hawkers.

Even in new development areas most pedestrian pathways are not user-friendly or handicap-friendly. More than half the accidents in the city involve pedestrians or cyclists; an average two cyclists die on Delhi roads every day.

BUILT FORM: PARKING PROVISIONS

SCORE: **2.0/10**

Although improved metro connectivity to key areas, including the city center, has helped reduce parking demand, overall it continues to be a concern because of increasing private vehicle trips. Increasing private vehicle ownership and lack of door-to-door public transport connectivity has resulted in parking being a major issue in residential and local commercial areas. The absence of properly designed off-street and underground parking facilities has further exacerbated the problem.

A new parking policy review will target vehicle ownership. Various multilevel parking facilities are either in use or under construction, but these are primarily restricted to commercial areas and transport hubs. Residential parking continues to be a major concern for the city.

FUTURE MOBILITY: SERVICES

SCORE: **4.0/10**

DTC launched point-to-point bus services for office-goers on 1 May 2018. These buses are in addition to regular DTC services.

Twenty low-floor buses have been introduced to run non-stop between destinations in residential suburbs and office areas in central, south and northwest Delhi. These buses leave residential areas between 8:00am and 8:50am and make the return journey about 6:00pm.

Zoomcar, JustRide, MiCar, Carzonrent, Selfdrive.in, Voler, RentoMojo and many other private players are exploring opportunities in the self-drive car rental (car-sharing) market in India. According to an estimate, more than 10 companies are working in the segment in Delhi, with new players continually joining.

The other operators are also launching various campaigns, packages and services to increase their user base. They are also integrating technologies such as driver behavior monitoring and on-board diagnostics in their cars.

Many on-demand services are available in Delhi and the National Capital Region (NCR) including Ola, Uber and Jugnoo. Other, lesser-known companies are launching services. One newcomer is Gurgaon-based AUTOnCAB (founded in March 2014) that provides on-demand, ultra-budget-friendly, last-mile connectivity to urban commuters. It is focused on the needs and demands of both car drivers and commuters. It provides drivers with ancillary income options through related means, such as logistics/delivery services. The company is running 30,000 rides a month in six cities: Gurgaon, Noida, Ghaziabad, Chandigarh, Kota and Jaipur.

Ridely is one ride-sharing platform in Delhi-NCR in which travelers find people and carpool with them to their common destination. It also helps them to track rides (car location) in real-time.

BlaBlaCar is an online marketplace for carpooling. Its website and mobile apps connect drivers and passengers willing to travel together between cities and share the cost of the journey. It also operates in Delhi-NCR.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **5.0/10**

The Delhi Government is a big supporter of electric vehicles because of the level of pollution in the state. Although only a few thousand electric vehicles are on the road, the government expects the number to swell in the next 20 years. It is also working on the development of a comprehensive electric vehicle policy.

There is evidence of the government's commitment with:

- Plans to launch a bus terminal run totally on an electric mode
- A proposal to subsidize the purchase of electric cars by 59 per cent
- Initiatives in its annual budget to promote the use of clean fuel and boost public transport by buying more than 3,900 new buses in 2018 to 2019.

The government has declared that setting up charging stations for electric vehicles does not need a separate license under the Electricity Act of 2003, a move welcomed by the industry.

Both the New Delhi Municipal Council (NDMC) and South Delhi Municipal Council aim to set up at least 30 charging stations for public vehicles and more than 100 stations for private vehicles.

The NDMC has already installed 37 charging stations at various locations. Under the Delhi Electric Regulatory Authority regime, energy consumption charges will be reduced on commercial connections if the user provides documents to its power company about its usage for charging electric vehicles.

The Indian Government also has developed a National Electric Mobility Mission Plan 2020, which proposes incentives for the adoption of green vehicles and facilitates domestic car manufacturing capability. Currently, there is no enthusiasm for adopting driverless cars.

A draft policy developed by the Aviation Ministry at a national level permits the use of unmanned aerial vehicles for commercial purposes.

Drones are being used across the country in construction, agriculture, industrial monitoring, photography, video and disaster management and could soon be soon utilized in delivering packages to emergency services.

TECHNOLOGY
4.7/10

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **5.0/10**

The Delhi Government acknowledges the impact of the knowledge and information that can be accessed using the internet.

The city aims to bolster the internet economy and improve areas such as trade and tourism, women's safety, security applications and worker productivity. The government wants to provide all its citizens with access to free Wi-Fi, seeing it as a socio-economic booster, but the strategy and policy are so far missing.

However, the government is trying to achieve this vision through a project that aims at providing universal access to the internet. The Delhi Dialogue Commission was set up as an advisory body charged with finding solutions to a range of civic issues by studying good practices, policies and plans from across the country and the world and conveying them in the form of concrete recommendations.

A Wi-Fi and CCTV Task Force focuses on the commitment of free Wi-Fi for all citizens.

In its 2018-19 Budget, the Delhi Government allocated CAD19 million for a Wi-Fi facility, even though the government did not give a deadline for completion of the project.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **4.0/10**

The average fixed broadband download speed in India is 20.72 Mbps and mobile speed is 9.01 Mbps. New Delhi has a speed of 23.57 Mbps, slightly faster than the nation's average. In 2004, the Department of IT published guidelines for broadband internet connection.

A nationwide program, called BharatNet, or the National Optical Fiber Network project, began in 2011 to connect all 250,000 village councils in the country through optical fiber and establish a network infrastructure. As of 21 January 2018, optical fiber connectivity had been provided to 110,848 councils by laying 258,635 kilometers of optical fiber cable and 101,936 councils have been made service-ready under the BharatNet project.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **4.0/10**

In the 2015 elections, the government promised to provide free Wi-Fi access to people in public places, but this has not eventuated. The Public Works Department, which was given the responsibility, has shied away from the project.

Though 4G is spreading quickly, India's data speed is pedestrian by world standards. In OpenSignal's report on 4G speed, India's 6.07 Mbps was at the bottom of the pile of 77 countries. The countries in the top five have average download speed ranging from 42.12 Mbps to 44.31 Mbps.

The introduction of 5G is still some way off. A 2020 to 2021 rollout is the government's plan.

OPEN DATA

SCORE: **5.0/10**

In 2012, a National Data Sharing and Accessibility Policy came into place. The policy was designed to promote data sharing and enable access to data owned by Government of India. The policy explicitly states that access to data under the policy would not be in violation of any national law.

There is also an open government platform (http://data.gov.in) aiming to enhance public access to government data and documents, and through it engagement between citizens and the government.

The government also introduced Open Government Data License of India to ensure that the data sets released are not misused or misinterpreted (for example, by insisting on proper attribution) and that all users have the same and permanent right to use the data.

INFORMATION AND DATA SECURITY

SCORE: **5.0/10**

The national government is planning a data protection law in the wake of rising cyber-attacks and privacy breaches. There are information technology legal frameworks in place including the BIS Act, Indian Telegraph Act (security guidelines under the telecom licensing terms and conditions) and IT Act (dealing with any sensitive personal data or information in a computer resource). However, nothing on cyber security was mandated in these.

In 2013, the Ministry of Communications and Information Technology (India) came up with a national cybersecurity policy designed to protect information infrastructure in cyberspace, reduce vulnerabilities, build capabilities to prevent and respond to cyber threats and minimize damage from cyber incidents.

The government also has plans for creating a National Cyber Coordination Centre, an agency for cyber-crime prevention, investigation and training purposes.

The national program Aadhaar is run by the Unique Identification Authority of India to develop digital identities by assigning biometric-based, twelve-digit personal identification numbers. It hasn't been a successful initiative because of multiple changes made by the government.

It started as a voluntary program, but turned out to be a controversial digital identity program with the number of data leakages incidents rising.

The fact that it involves a lot of confidential information made it vulnerable to social risks. In this situation, there was a lack of adoption of security measures. After the increase in security breaches, the government introduced a system of virtual authentication for citizens enrolled on its database and limited the access available to service providers.

PLANNING AND POLICY

SCORE: **5.0/10**

The telecommunications infrastructure in India is poised to grow in the wake of initiatives to make Digital India a successful program. A sum of CAD25 billion will be invested in upgrading and expanding infrastructure.

The government owned fixed line and mobile telco (Delhi headquartered), BSNL entered a strategic alliance with home-grown device maker Micromax to offer bundled plans at less than CAD2 a month, including CAD1.94 a month with unlimited voice calls and data.

To enable the adoption of emerging technologies such as machine learning, artificial intelligence (AI), Internet of Things (IoT), the Finance Ministry has allocated CAD600 million to the Department of Science and Technology.

The government draft of the new telecom policy says the aims are to create four million new jobs by 2022, attract CAD130 billion investment in the sector and ensure broadband coverage at 50 Mbps for every citizen.

National initiatives such as Digital India, Start-up India, and Make in India would help India showcase its knowledge and digital society. The Niti Ayog (policy think tank of the Government of India) will establish a national program in AI including research and development of its applications.

URBAN SYSTEMS
3.8/10

POWER GENERATION AND DISTRIBUTION

SCORE: **3.4/10**

Delhi is a very dense city and must rely on allocations from central power plants to meet its requirements. Of the total 7,839 MW allocated to Delhi, only 1,935 MW is generated within Delhi and most of its own generation capacity is from gas-fired power plants. The summer season brings maximum demand in Delhi as temperatures hit 45 degrees Celsius. The peak demand in Delhi is expected to rise to 9,000 MW in 2021 to 2022, up from 6,560 MW in the financial year just ended. Delhi's appetite for power grew about 6.3 per cent from 2009 to 2015. The rate is now 7 per cent.

Power supply in Delhi has been unbundled and handed over to private companies that have a majority stake (51 per cent) while the Delhi Government holds 49 per cent. After the unbundling and privatization, the average load shedding has been reduced to 0.15 per cent. The present state government also provides a 50 per cent subsidy to consumers that use less than 400 units of electricity every month.

In 2016, the Delhi Government released a policy aimed at making the national capital a solar city. The aim of the solar policy is to install one gigawatt of solar power capacity by the year 2020 and two gigawatts of solar power capacity by 2025. The policy also mandates deployment of solar panels on all government buildings in the next five years and says distribution companies should meet 75 per cent of their solar renewable purchase obligation. Because of its high population density and high-rise buildings, Delhi has no hope of meeting its demand from its own renewable potential, which is only solar.

WATER TREATMENT AND DISTRIBUTION

SCORE: **3.6/10**

In 2050, India's water demand is projected to reach 1,180 billion m^3, which will outstrip the total availability of 1,137 billion m^3. By 2051, the population of Delhi is estimated to be 10 million more than it is now. Water availability will be reduced.

The average annual per capita water availability in 2011 was assessed as 1,545 m^3 and is projected to be 1,140 m^3 in 2050. An annual per capita water availability of less than 1,700 m^3 is a water-stressed situation and anything less than 1,000 m^3 is a water scarcity condition.

The Delhi Government's response comprises:

- A new draft policy to achieve water security that endorses reuse of treated sewage by as much as 80 per cent in 2027 to augment water availability.
- The New Delhi Municipal Corporation has developed seven functioning sewage plants and has plans to create over 10 more to meet horticulture needs and save groundwater and begin the process of removing waste-water flows from river flows. The government is also promoting decentralized sewage treatment plants to deal with the wastewater load in the city.
- A provision for recycling treated wastewater with separate lines for potable water and recycled water.
- It is mandatory for new building complexes to install water and sewage treatment plants.
- The Delhi Jal Board has made it mandatory for all new buildings, built on more than 100 m^2 and above or which discharge more than 10,000 litres of water, to install a rainwater harvesting system.

WASTE MANAGEMENT

SCORE: **4.2/10**

India generates about 25,940 tons of plastic waste a day, of which Delhi contributes the largest share (690 tons a day). Even though 94 per cent of the plastic is recyclable, the recycling sector is largely disorganized and incapable of handling the volume.

With effect from November 2012, the Delhi Government imposed a ban on the manufacture, sale, storage, usage, import and transport of plastic carry bags in the NCT. Also, their use had taken a backseat following a government crackdown in August 2017 after the National Green Tribunal banned their use and imposed a penalty of CAD96 on each offender. However, the reality is that markets are still overflowing with plastic bags.

In a February 2016 update, the Central Pollution Control Board states that as much as 8,370 tons a day of municipal waste was generated in Delhi, out of which 8,300 tons were collected and 3,240 tons treated.

The per capita generation in the city ranges from 550-to-600 grams a day. The city has a processing capacity of 6,100 tons, thanks to its three incineration plants and two centralized composting units.

Five municipal authorities are responsible for solid waste generation and management. There are three landfill sites, Bhalswa (commissioned in 1994), Ghazipur (1984) and Okhla (1996). In the absence of landfill alternatives, all the five municipal bodies are also using these three sites for illegal disposal of solid waste. Another integrated municipal solid waste management plant of 4,000 tons-per-day capacity has been developed at Narela-Bawana and is operational for half that amount.

About 4,600 tons a day of solid waste is disposed of in Delhi's landfill sites.

In addition, there are three Waste to Energy (WTE) plants in Delhi:

- Timarpur-Okhla: capacity 1,950 tons a day, with electricity generation capacity of 16 MW
- Ghazipur: capacity 1300 tons a day, with electricity generation capacity of 12 MW
- Narela: capacity 3000 tons a day, with electricity generation capacity of 24 MW.

The building of WTE plants can arouse strong emotions. In the suburb of Delhi, in Noida's Sector 123, there have been violent protests from residents as the authorities go ahead with setting up such a plant.



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24

BOGOTÁ



Emerging as South America's newest metropolis, Bogotá is the capital of Colombia and the country's largest city. With more than eight million inhabitants, it is bigger than Hong Kong and Washington, D.C. The city is a melting pot of diversity and multiculturalism, its modern and colonial architecture colored by the rich red of prolific brick buildings and offset by the refreshing green of numerous parks and gardens.

With a commercial heart that beats strongly, Bogotá is undergoing a transformation. In short, it is very much open for business. The city's strategic location and proximity to New York, Mexico City and Sao Paulo makes it the logical gateway for the Latin American market. While Bogotá is connected through the Eldorado Airport, Pan-American Highway and a vast network of roads, traffic congestion can bring the city to a standstill.

Economically, Bogotá has performed well in the past decade, sustaining steady growth. This performance has been driven mostly by exports, including petroleum and manufacturing, a burgeoning services sector and a vastly improved security climate. These factors have been instrumental in instilling confidence in the economy and attracting foreign investment.

Today, Bogotá is considered a creative hub with a thriving fashion industry and a record of producing digital content for the Spanish speaking market. It has been underpinned by a focus on connectivity. Not surprisingly, Colombia's information technology industry is the fastest growing in the world and the country boasts the longest fiber optic network in South America.

The city's rapid urbanization has placed a strain on infrastructure and has been countered by 20 years of substantial efforts to remedy it. The introduction of a comprehensive mobility policy revitalized thousands of square meters of public spaces, aided by the implementation of TransMilenio — an aboveground mass transportation system operated by high-capacity buses along dedicated lanes — and a comprehensive network of segregated bicycle tracks. On *car-free* Sundays, 100 kilometers of city streets become the domain of cyclists and pedestrians for seven hours. These initiatives have helped change the city's image on the global stage while contributing to sustainability.

Despite its growing reputation as a smart and progressive city, Bogotá still faces many economic and social challenges. A lack of affordable housing has resulted in unplanned settlements in hazardous areas that are prone to landslides and floods.

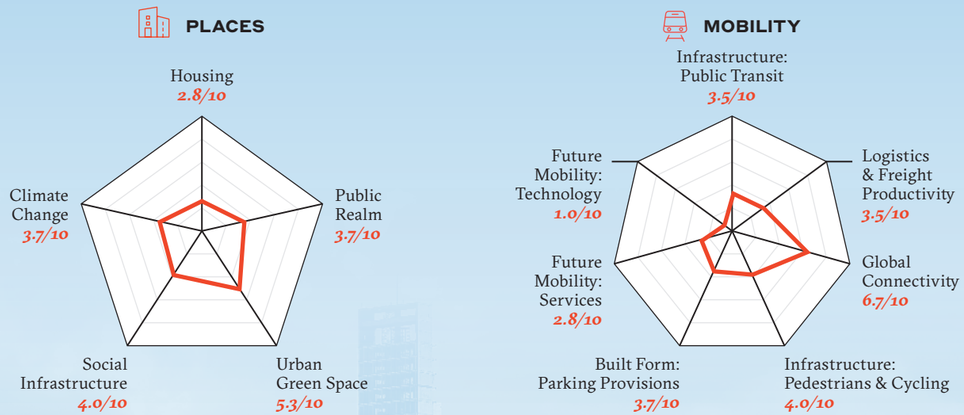
Billions of dollars are being poured into the city, from skyscrapers and transit systems to cultural and business centers. The question is, will this be enough to help address the bottlenecks that could hinder Bogotá's mobility, livability, social inclusiveness and competitiveness on the world stage?

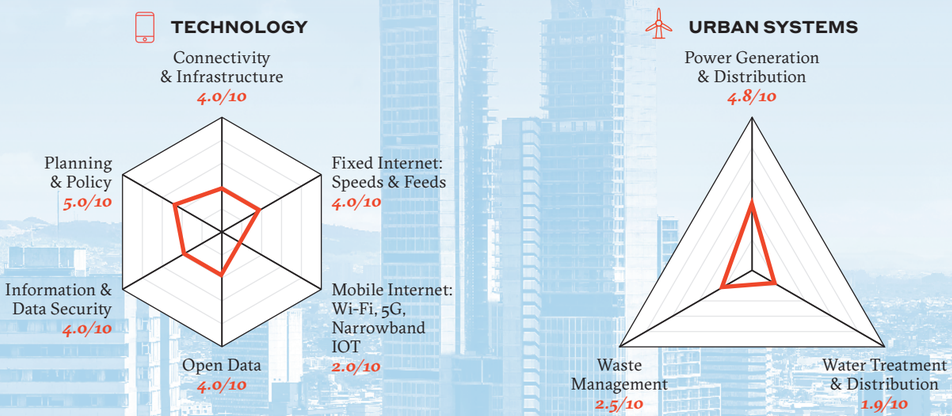
AT A GLANCE

RANKED **24**
CITY SCORE **14.36**

PLACES	MOBILITY	TECHNOLOGY	URBAN SYSTEMS
3.9/10	**3.6/10**	**3.8/10**	**3.0/10**

CITY ASSESSMENT





PLACES
3.9/10

HOUSING

SCORE: **2.8/10**

The expansion of Bogotá has followed a rapid path, swallowing up zones of high ecological value and marginalizing many sectors of the population. The result is a city that is extremely difficult to administer and tough on some of the inhabitants.

Rural-urban migration and associated rapid population growth, combined with the attractive offer of public services with a large coverage, resulted in vast sectors being occupied for housing, both with support from the state and illegally.

Before 2000, the Administrative Department of District Planning legalized 1,238 neighbourhoods, developed on 6,410 hectares, of which 457 hectares were available for green and communal areas. On the land dedicated to housing, 366,098 lots were located, from which a housing occupation of 1,369,278 people is estimated.

The residential properties to which public services are provided are classified in six socio-economic strata from the lowest (1) to the highest (6). Only 4.4 per cent of the population are in the top two brackets.

PUBLIC REALM

SCORE: **3.7/10**

The City of Bogotá is committed to increasing its urban renewal efforts to improve the social wellbeing of residents.

A Responsible Urban Renewal Plan, seeks to improve housing opportunities, increase regional connectivity, enhance public realm safety and sustain green neighbourhoods. The plan is putting the wellbeing of people at its core, taking a completely different approach to previously unsuccessful methods relying purely on physical interventions to address crime and violence issues.

At the center of the people-first plan is a series of social programs, community spaces and economic development programs that create a neighbourhood of empowered people. These programs are supported by a framework which guides future redevelopment in the district. This is financially supported by public-private partnerships leveraging market-rate developments to fund housing and social programs.

There is still work to be done in terms of closing the gap on provision of public space. At present, each permanent resident gets 3.93 square meters, compared with 15 square meters defined in the regulations.

URBAN GREEN SPACE

SCORE: **5.3/10**

Today, the capital has 5,206 parks and 1,485 green areas that total more than 8,800 hectares. The parks fall into the following categories:

- Regional: natural spaces of great dimension and environmental value, of which there is only one, Florida, and most of it is outside the perimeter of the city
- Metropolitan: areas of more than 10 hectares, dedicated to active or passive recreation and to the perpetuation of landscape values; Bogotá has 18
- Zonal: areas of one to ten hectares that meet the active recreation needs of a group of neighbourhoods and accommodate sports centers, swimming pools, courts and skating rinks; there are 78
- Neighbourhood scale: for the recreation, meeting and the integration of the community; there are 3,366
- Pocket: areas of less than 1,000 square meters, intended for children and seniors; there are 1,730.

SOCIAL INFRASTRUCTURE

SCORE: **4.0/10**

The District Development Plan, Bogotá Best For All, was approved by the city council in 2016. It lays out its priorities as modernization of the physical and technological infrastructure in health, construction of new schools, better mobility for everyone and a unified system of surveillance and communications and attention to citizens.

Diverse methods of financing are being considered for the plan. The administration is betting on public-private partnerships, through which it expects to collect 14.15 per cent of the total funds required.

Bogotá has become a hub for international infrastructure companies. It is the city in Colombia that has the largest portfolio of mega-infrastructure projects, becoming an attractive destination for any foreign company in the sector.

CLIMATE CHANGE

SCORE: **3.7/10**

The District Plan for Risk Management and Climate Change for Bogotá 2015-2050 organizes its activities and generates synergies with the other processes of environmental, territorial and development planning in the capital district. From here the components and programs of climate change and risk management are oriented for the next development plans.

It also includes the necessary mechanism for monitoring and evaluating the strategies and programs for risk reduction and adaptation to climate change that will be implemented.

MOBILITY
3.6/10

INFRASTRUCTURE: PUBLIC TRANSIT

SCORE: **3.5/10**

The mayor is behind a program called Building the New Bogotá, which focuses on the Integrated Transport System (TransMilenio) trunks of Avenidas 68 and Ciudad de Cali, ALO and Calle 13, Avenida Boyacá; and the perimeter roads of Gilma Jiménez Park and the Sabana Pedestrian Network.

Fast access roads exist but are mostly congested and hampered by such constraints as having only one fast-pass toll point at the entrance of Bogotá located in Chía.

Although there is a Transmilenio, it was not built to accommodate the number of people who use it daily.

LOGISTICS AND PRODUCTIVITY

SCORE: **3.5/10**

Colombia is considered an emerging economy with enormous potential for foreign investment.

The absence of adequate infrastructure is one of the major limitations for productivity and commerce in Colombia. This is mainly concentrated in transportation and infrastructure, which together are generating bottlenecks for logistics.

The government is working on the implementation of the National Logistics Policy & Transportation Master plan 2010-2032 which includes priority infrastructure projects, financing and strategies for attracting private capital, quality of services and regulatory policies, institutional framework and conditions for spreading good logistics practices.

As Colombia's major transport hub, Bogotá is working hard to reach its potential. As part of the master plan, the city has been granted a development extension which is not the largest, but it is the one that contains the highest concentration of consumer and industrial activity.

GLOBAL CONNECTIVITY

SCORE: **6.7/10**

Bogotá's El Dorado Airport, about 12 kilometers west of the international center of the city near the locality of Fontibon, is the main airport in Colombia.

It is the third most important airport in Latin America, strategically located to link with North America and the rest of the South American continent. Last year, it catered to almost 31 million passengers, 770,000 metric tons of cargo, and 304,330 aircraft movements.

In the big makeover that was completed last year, El Dorado was fitted with 50 elevators, 20 escalators and almost 24,000 square meters of retail space with more than 30 brand shops. The terminal now has six VIP rooms, can move more than 7,200 pieces of luggage an hour and has parking spaces for 1,669 vehicles. The transformation has also increased the number of aircraft docks to 39 contact and 13 remote from the previous 20 contact and 10 remote. The aim is for El Dorado to become one of the best airports in the world.

INFRASTRUCTURE: PEDESTRIANS AND CYCLING

SCORE: **4.0/10**

Bogotá's urban infrastructure of bicycle-exclusive lanes stretches 440 kilometers. There are 30 routes, five of which are longer than 20 kilometers. The longest is the North-Quito-South corridor 26.5 kilometers. These are all interconnected at some point, facilitating the flow of cyclists.

Bike paths and cyclists have been affected in recent years, like the rest of the city, by crime, especially in the sectors of Usaquen, Suba, Kennedy, Tunjuelito and Ciudad Bolivar; where cyclists run the risk of their bikes being stolen.

BUILD FORM: PARKING PROVISIONS

SCORE: **3.7/10**

Although parking meters were invented more than 80 years ago, Bogotá has been slow to embrace them and consequently has missed a financial opportunity. Although only a small proportion of the population owns cars, parked cars dominate the streets, sidewalks and block bicycle lanes, despite signs for no parking.

Experts believe that stipulations on the minimum number of parking spaces buildings must have, driven up real estate prices and promoted motorization. For example, BD Bacatá, the tallest building in the city (with 67 floors), has 433 private and 334 public parking spots.

The city is formulating plans for regulating on-street parking and is looking at eliminating parking minimums.

FUTURE MOBILITY: SERVICES

SCORE: **2.8/10**

In Colombia, vehicles used for public transport are regulated.

If a person accesses this service, they do so at their own responsibility as there is no insurance protecting them.

The National Government has not implemented public policies for the use of shared cars.

FUTURE MOBILITY: TECHNOLOGY

SCORE: **1.0/10**

Colombia has a vehicle fleet consisting of 6.8 million private vehicles and 5.5 million motorcycles, among which electric and hybrid vehicles represent only 0.11 per cent of the market. The lack of clean technologies in the transport sector is mainly due to the absence of robust public policy. For example, it would be beneficial if the use of vehicles that are older than 20 years was discouraged.

A 29 June 2017 decree offered tariff and tax incentives for electric and hybrid vehicles entering the country and set a quota of 3,000 vehicles by 2019. A lot of work is required to build a clear regulatory framework that allows the mass take-up of these technologies.

TECHNOLOGY
3.8/10

Some of the metrics do not include a narrative as written information was not available from the respective agencies.

CONNECTIVITY AND INFRASTRUCTURE

SCORE: **4.0/10**

The Ministry of Information and Communications Technologies, according to Law 1341 or the ICT Law, is the entity in charge of designing, adopting and promoting the policies, plans, programs and projects in the Information and Communications Technologies (ICT) sector.

Part of its function is to increase and facilitate every citizen's access to ICT.

There is a ministry in charge of designing, formulating, adopting and promoting the policies, plans, programs and projects of the ICT sector in alignment with the Political Constitution and the law, in order to contribute to the economic, social and political development of the nation and raise the wellbeing of Colombians. Overall, the ministry aims to:

- Promote the use and appropriation of ICT among citizens, companies, the government and other national entities to support social, economic and political development
- Promote the development and strengthening of the ICT sector
- Promote research and innovation, seeking its competitiveness and technological progress
- Define the policy and exercise the management, planning and administration of the radio spectrum and of postal and related services, except for what the law expressly dictates.

FIXED INTERNET: SPEEDS AND FEEDS

SCORE: **4.0/10**

Bogotá offers technological tools and strategic information to food producers, transporters, transformers, logistics operators, distributors, social support organizations and consumers, to facilitate opportunities for access to timely and efficient information for doing business in the global economy.

MOBILE INTERNET: WI-FI, 5G, NARROWBAND IOT

SCORE: **2.0/10**

OPEN DATA

SCORE: **4.0/10**

INFORMATION AND DATA SECURITY

SCORE: **4.0/10**

PLANNING AND POLICY

SCORE: **5.0/10**

URBAN SYSTEMS
3.0/10

POWER GENERATION AND DISTRIBUTION

SCORE: **4.8/10**

Colombia has a rich endowment of energy sources and the country is heavily reliant on installed hydropower, accounting for 65 per cent of annual consumption, which provides cost-effective electricity. It has strong potential for nonconventional sources of energy generation, particularly solar, wind and biomass. According to the UN Industrial Development Organization and the International Center on Small Hydro Power, in 2010, the country saw its highest growth for renewable energy generation, totaling 2,543 MW of added capacity. It is estimated that large-scale onshore wind and large-scale geothermal would be able to achieve the same cost per kilowatt as that of current hydroelectric generation.

Colombia's electricity and energy sector is under the jurisdiction of the Ministry of Mines and Energy (MME). The MME has adopted an Indicative Action Plan and established a target of achieving 3.5 per cent of on-grid and 20 per cent of off-grid generation from renewable sources by 2015. These targets are to be increased to 6.5 per cent and 30 per cent respectively in 2020. However, there are no legislative targets associated with the accomplishment of these goals.

In terms of wind energy, the Department of La Guajira stands out for its high natural resources in this area (estimated at 21 GW of capacity). Winds in La Guajira have been classified as Class 7 (close to ten meters per second annual average), making it one of only two regions in Latin America with winds of this speed. The Jepirachi wind farm, the first operational wind farm in the country, is in this area. There is also potential for large-scale solar generation in the Orinoco and San Andrés areas in the northern part of the country.

In addition, biomass energy has a positive outlook due to the large quantities of agricultural and forestry waste produced in the country. Important sources of agricultural waste come from banana plantations, rice, coffee, and livestock. The most suitable places for generating this form of energy are the areas of Santander and Norte de Santander, Valle del Cauca, Llanos Orientales, and the Caribbean coast.

In Bogotá, two PP20 biomass gasifier-gensets were installed in the José Celestino Mutis Botanical Gardens. This is Colombia's largest botanical garden and serves both as a recreation space and a research center. The biomass gensets are part of a program to create a sophisticated demonstration site featuring multiple forms of renewable power generation integrated into a micro-grid, including solar arrays and energy storage. The garden which is a municipally-owned park and has an emphasis on Andean and Páramo ecosystems; features plants from every Colombian altitude, climate and region, and is renowned throughout Colombia. It was founded in 1955, in honor of botanist and astronomer José Celestino Mutis. It covers 19.5 acres and groups its collections of plants according to their original ecosystems.

Columbia also has small-scale hydropower. There is an estimated 25 GW of naturally occurring potential for electricity generation, mainly in the Andean region. Concerns about the environmental impact of hydropower, and the fact that large-scale hydroelectric plants are already located in the best places, are likely to put a halt on further developments in this sector.

WATER TREATMENT AND DISTRIBUTION

SCORE: **1.9/10**

A plan prepared by the District Secretariats of Environment and Habitat establishes six water strategies related to planning, control, monitoring, childrens' and youths' rights to water, risk management and environmental education that will be developed in the next decade and seeks to conserve this resource. It also aims to guarantee the right of this resource to the citizens of the capital and meet the basic needs of food, health and sanitation. The plan also intends to provide the minimum to the most vulnerable population in the next 10 years.

For this period the District Water Plan pledges to provide the first six cubic meters of water a month, free to each of the poorest subscribers of the aqueduct service.

The Aqueduct and Sewerage Company of Bogotá has more than 35,293 active accounts that fall into the poorest category, of which 13,527 are in Bogotá with the remainder in Soacha.

WASTE MANAGEMENT

SCORE: **2.5/10**

SDA Solid Waste oversees the provision of technical advice and evaluation of the issues related to the management of waste in the city. It promotes the implementation of the subprograms of the scenario and materials cycle of the District Environmental Management Plan.

Guides for the management and integral management of waste include: cosmetics and toilet, tanneries, pharmaceutical, printing and lithography, laundries, timber, metalworking, paintings, chemical substances and substances, textile and dry cleaning, vehicle washing, dangerous residues and conventional waste.

A study of alternatives to provide adequate management for the use of packaging and containers and to stimulate the use of their waste in Bogotá, D.C. includes:

- Waste card
- The green book of the office
- Guide for the handling of used tires
- Subsystem of information on the use of renewable natural resources – SIUR
- Waste from the health and related sector
- Special waste.

SOURCES

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PART TWO: STATISTICS

In this part of the Index, we share trends on cities' preparedness for growth, in terms of population and GDP, based on data sourced from The Economist Intelligence Unit (EIU).

ABOUT THE DATA

City definition: The (EIU) uses the concept of metropolitan area rather than the official administrative boundaries for the city-level calculations. This provides a consistency of definition and a more relevant measure by accounting for the total market potential of the urban agglomeration. In contrast, an administrative boundary can, in some cases, not give a representative picture of the economic city. Whenever available, an official definition of the metropolitan area is used, while checking that the official definition corresponds to EIU's internal criteria: the metropolitan area encompasses the city core and its contiguous urban surroundings. When no official metropolitan area definition can be identified, the EIU uses alternative sources of information such as population density to help define the metropolitan city. EIU makes every effort to provide a standard definition of cities and their boundaries so that direct comparisons can be made between cities both nationally and internationally.

In New York City, for example, the administrative boundaries (the five boroughs) have an estimated population of 8.6 million for 2017, whereas in the definition used by EIU, the population is 20.48 million for 2018, including the contiguous urban agglomeration stretching into areas such as Newark, New Jersey and Long Island.

Data availability is a significant issue when compiling data, particularly at city-level. Where necessary, EIU has interpolated and estimated data, for example, based on assumptions of similar patterns or population structures using information at a higher administrative level and where data are available.

Demographic Projections: Where reliable official projections consistent with the EIU concept of the metropolitan area are available, that is used. The EIU also uses a variety of methods to estimate figures, such as breaking down a larger unit for which data is available into smaller units, and using historical relationships to calibrate the definition of a city to whatever units are available in official statistics (in some cases these are smaller units, in other cases they are larger). The EIU analysts also use their specialist city and country knowledge to inform these ratios. Gender and age distribution is similarly projected from harmonizing the available historic information for different geographic levels and calibrating to the cities projection.

GDP: City-level GDP is rarely accurately measured in official statistics, and so needs to be estimated; typically, this is based on GDP of its surrounding administrative division such as state, province, or nation (in the case of a small country). The EIU evaluates a city's level of economic development in comparison to its surrounding geographic divisions and develop a city GDP multiplier. The multiplier is then applied to national GDP forecast to obtain the city GDP forecast. The multiplier is updated whenever new city level data becomes available.

Livability: The EIU livability survey assesses which locations around the world provide the best or the worst living conditions. Each factor in a city is rated as acceptable, tolerable, uncomfortable, undesirable or intolerable. The ratings for terrorism, petty crime, violent crime and civil unrest are assessed by EIU city experts using a scale of one-to-five. Where possible these will be based on quantitative and verifiable data points. For example, the petty crime measure refers to minor activities, such as theft where no physical harm comes to the victim. A rating of one would apply to cities where crime rates are low enough for stealing, etc. to occur on an extremely rare occasion (e.g. Singapore). A rating of five would apply to cities where such activities are everyday and commonplace (e.g. Caracas).

Sources: Data sources for the EIU are derived from National Statistics Offices, National Bureaus of Statistics, World Bank International Comparison Program, Statistics Korea and Department of Budget, Accounting and Statistics of Taipei City Government, and the 2017 Livability Report data.

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AUCKLAND

Area: **4,894km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	1.39m	1.50m	1.64m
Population (city population as % of country)	29.34%	29.85%	30.51%
Gender (Male | Female as % of city population)	49.20% | 50.80%	49.20% | 50.80%	49.98% | 50.78%
Education (attained tertiary qualifications as % of city population)	25.24%	Not Available	Not Available
Labour force (working-age population as % of city population)	67.49%	Not Available	Not Available
Net foreign migration (as % of city population)	2.37%	Not Available	Not Available
Household size (number of people per household)	2.90	2.70	2.59

ECONOMY	2018	2025	2035
GDP (CAD billion)	78.78	108.58	170.06
Employment (as a % of labour force)	68.52%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	71,272	82,756	114,580
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	43,837	57,986	91,707

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

BEIJING

Area: **12,187km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	20.07m	21.88m	22.42m
Population (city population as % of country)	1.46%	1.55%	1.57%
Gender (Male | Female as % of city population)	51.60% | 48.40%	51.60% | 48.40%	51.36% | 48.64%
Education (attained tertiary qualifications as % of city population)	22.75%	Not Available	Not Available
Labour force (working-age population as % of city population)	77.57%	Not Available	Not Available
Net foreign migration (as % of city population)	0.20%	Not Available	Not Available
Household size (number of people per household)	2.50	2.40	2.30

ECONOMY	2018	2025	2035
GDP (CAD billion)	952.9	1,853.6	4,269.3
Employment (as a % of labour force)	92.48%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	58,151	78,902	92,517
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	442,399	669,942	913,499

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	3
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	75

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

BOGOTÁ

Area: **419km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	10.36m	11.40m	12.49m
Population (city population as % of country)	20.95%	21.98 %	23.11%
Gender (Male | Female as % of city population)	49.20% | 50.80%	49.10% | 50.90%	48.90% | 51.10%
Education (attained tertiary qualifications as % of city population)	21.96%	Not Available	Not Available
Labour force (working-age population as % of city population)	51.79%	Not Available	Not Available
Net foreign migration (as % of city population)	0.92%	Not Available	Not Available
Household size (number of people per household)	3.50	3.30	3.20

ECONOMY	2018	2025	2035
GDP (CAD billion)	321.2	488.8	857.6
Employment (as a % of labour force)	67.07%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	40,895	47,859	62,805
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	203,212	275,431	414,680

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	5
Violent crime (prevalence of violent crime)	4
Civil unrest (threat of civil unrest)	3
Stability (overall stability rating)	35

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

BRISBANE

Area: **5,327km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.31m	2.56m	2.86m
Population (city population as % of country)	9.34%	9.53%	9.70%
Gender (Male | Female as % of city population)	49.8% | 50.2%	49.80% | 50.20%	49.72% | 50.3%
Education (attained tertiary qualifications as % of city population)	17.66%	Not Available	Not Available
Labour force (working-age population as % of city population)	67.74%	Not Available	Not Available
Net foreign migration (as % of city population)	0.79%	Not Available	Not Available
Household size (number of people per household)	2.90	2.90	2.88

ECONOMY	2018	2025	2035
GDP (CAD billion)	163.5	228.8	365.4
Employment (as a % of labour force)	72.19%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	102,288	123,567	163,407
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	98,500	132,115	196,937

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

CALGARY

Area: **5,110km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	1.42m	1.55m	1.70m
Population (city population as % of country)	3.84%	3.97%	4.05%
Gender (Male | Female as % of city population)	49.60% | 50.40%	49.70% | 50.30%	49.73% | 50.27%
Education (attained tertiary qualifications as % of city population)	38.50%	Not Available	Not Available
Labour force (working-age population as % of city population)	73.82%	Not Available	Not Available
Net foreign migration (as % of city population)	1.13%	Not Available	Not Available
Household size (number of people per household)	2.80	2.70	2.61

ECONOMY	2018	2025	2035
GDP (CAD billion)	144.2	184.8	279.3
Employment (as a % of labour force)	93.18%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	102,745	109,790	139,365
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	61,738	75,243	108,038

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	1
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	100

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

COPENHAGEN

Area: **2,778km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.05m	2.18m	2.35m
Population (city population as % of country)	35.76%	37.02%	38.40%
Gender (Male | Female as % of city population)	49.70% | 50.30%	49.60% | 50.40%	49.73% | 50.27%
Education (attained tertiary qualifications as % of city population)	27.69%	Not Available	Not Available
Labour force (working-age population as % of city population)	74.26%	Not Available	Not Available
Net foreign migration (as % of city population)	2.30%	Not Available	Not Available
Household size (number of people per household)	2.10	2.10	2.18

ECONOMY	2018	2025	2035
GDP (CAD billion)	166.8	223.5	334.1
Employment (as a % of labour force)	86.88%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	74,604	91,083	114,826
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	78,579	98,358	138,184

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	85

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

DUBAI

Area: **1,146km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.74m	3.23m	3.84m
Population (city population as % of country)	24.10%	25.68%	32.52%
Gender (Male | Female as % of city population)	72.06% | 27.94%	69.98% | 30.02%	67.53% | 32.47%
Education (attained tertiary qualifications as % of city population)	44.80%	Not Available	Not Available
Labour force (working-age population as % of city population)	82.99%	Not Available	Not Available
Net foreign migration (as % of city population)	9.71%	Not Available	Not Available
Household size (number of people per household)	6.49	6.49	6.49

ECONOMY	2018	2025	2035
GDP (CAD billion)	241.3	405.6	650
Employment (as a % of labour force)	88.32%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	224,207	354,453	645,096
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	136,442	254,123	549,091

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	85

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

EDINBURGH

Area: **146km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	0.89m	0.94m	0.98m
Population (city population as % of country)	1.33%	1.36%	1.37%
Gender (Male | Female as % of city population)	49.40% | 50.60%	49.50% | 50.50%	49.72% | 50.28%
Education (attained tertiary qualifications as % of city population)	57.12%	Not Available	Not Available
Labour force (working-age population as % of city population)	69.80%	Not Available	Not Available
Net foreign migration (as % of city population)	1.35%	Not Available	Not Available
Household size (number of people per household)	2.40	2.40	2.43

ECONOMY	2018	2025	2035
GDP (CAD billion)	69.3	90.6	137.2
Employment (as a % of labour force)	72.95%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	98,127	115,881	155,581
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	44,503	53,357	77,698

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	Not Available
Petty crime (prevalence of petty crime)	Not Available
Violent crime (prevalence of violent crime)	Not Available
Civil unrest (threat of civil unrest)	Not Available
Stability (overall stability rating)	Not Available

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

LONDON

Area: **8,382km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	12.14m	11.91m	11.62m
Population (city population as % of country)	17.58%	15.76%	14.93%
Gender (Male | Female as % of city population)	49.40% | 50.60%	49.50% | 50.50%	49.72% | 50.28%
Education (attained tertiary qualifications as % of city population)	45.29%	Not Available	Not Available
Labour force (working-age population as % of city population)	65.44%	Not Available	Not Available
Net foreign migration (as % of city population)	1.41%	Not Available	Not Available
Household size (number of people per household)	2.50	2.50	2.51

ECONOMY	2018	2025	2035
GDP (CAD billion)	1,182.3	1,518.9	2,223.1
Employment (as a % of labour force)	72.89%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	116,643	142,171	194,705
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	697,553	832,827	1,108,308

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	3
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	70

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

MANCHESTER

Area: **1,276km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.97m	3.13m	3.26m
Population (city population as % of country)	4.45%	4.54%	4.53%
Gender (Male | Female as % of city population)	49.40% | 50.60%	49.50% | 50.50%	49.72% | 50.28%
Education (attained tertiary qualifications as % of city population)	38.72%	Not Available	Not Available
Labour force (working-age population as % of city population)	70.61%	Not Available	Not Available
Net foreign migration (as % of city population)	1.24%	Not Available	Not Available
Household size (number of people per household)	2.50	2.50	2.52

ECONOMY	2018	2025	2035
GDP (CAD billion)	157.8	205.0	308.8
Employment (as a % of labour force)	62.99%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	68,624	80,493	108,055
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	100,264	123,908	172,758

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	75

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

MELBOURNE

Area: **6,189km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	4.38m	4.79m	5.31m
Population (city population as % of country)	17.68%	17.84%	17.98%
Gender (Male | Female as % of city population)	49.80% | 50.20%	49.80% | 50.20%	49.72% | 50.28%
Education (attained tertiary qualifications as % of city population)	21.87%	Not Available	Not Available
Labour force (working-age population as % of city population)	69.72%	Not Available	Not Available
Net foreign migration (as % of city population)	1.87%	Not Available	Not Available
Household size (number of people per household)	3.00	3.00	2.94

ECONOMY	2018	2025	2035
GDP (CAD billion)	283.8	397.8	634.9
Employment (as a % of labour force)	71.23%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	104,907	128,443	171,570
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	187,563	252,235	375,998

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

MEXICO CITY

Area: **7,854km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	21.50m	22.92m	24.93m
Population (city population as % of country)	16.44%	16.24%	16.29%
Gender (Male | Female as % of city population)	49.80% | 50.20%	49.80% | 50.20%	51.53% | 50.22%
Education (attained tertiary qualifications as % of city population)	17.50%	Not Available	Not Available
Labour force (working-age population as % of city population)	73.78%	Not Available	Not Available
Net foreign migration (as % of city population)	1.41%	Not Available	Not Available
Household size (number of people per household)	5.30	5.40	5.47

ECONOMY	2018	2025	2035
GDP (CAD billion)	780.7	1,017.4	1,562.5
Employment (as a % of labour force)	57.22%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	78,698	87,097	119,837
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	523,271	596,668	881,694

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	5
Violent crime (prevalence of violent crime)	5
Civil unrest (threat of civil unrest)	3
Stability (overall stability rating)	40

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

MONTRÉAL

Area: **4,604km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	4.09m	4.34m	4.65m
Population (city population as % of country)	11.06%	11.09%	11.11%
Gender (Male | Female as % of city population)	49.60% | 50.40%	49.70% | 50.30%	49.73% | 50.27%
Education (attained tertiary qualifications as % of city population)	46.47%	Not Available	Not Available
Labour force (working-age population as % of city population)	66.57%	Not Available	Not Available
Net foreign migration (as % of city population)	1.29%	Not Available	Not Available
Household size (number of people per household)	2.50	2.40	2.35

ECONOMY	2018	2025	2035
GDP (CAD billion)	225.2	291.7	435.8
Employment (as a % of labour force)	92.25%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	71,076	79,161	101,269
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	136,486	168,002	238,363

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

NEW DELHI

Area: **782km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	18.98m	21.96m	26.63m
Population (city population as % of country)	1.40%	1.50%	1.70%
Gender (Male | Female as % of city population)	52.90% | 47.10%	52.30% | 47.70%	51.74% | 48.26%
Education (attained tertiary qualifications as % of city population)	16.37%	Not Available	Not Available
Labour force (working-age population as % of city population)	35.03%	Not Available	Not Available
Net foreign migration (as % of city population)	0.31%	Not Available	Not Available
Household size (number of people per household)	4.70	4.60	4.48

ECONOMY	2018	2025	2035
GDP (CAD billion)	535.5	1,051.2	2,453.1
Employment (as a % of labour force)	95.39%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	37,365	60,704	100,102
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	199,570	385,945	794,003

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	3
Violent crime (prevalence of violent crime)	3
Civil unrest (threat of civil unrest)	3
Stability (overall stability rating)	55

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

NEW YORK

Area: **21,481km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	20.48m	21.19m	22.00m
Population (city population as % of country)	6.27%	6.17%	6.03%
Gender (Male | Female as % of city population)	49.50% | 50.50%	49.60% | 50.40%	49.67% | 50.33%
Education (attained tertiary qualifications as % of city population)	38.68%	Not Available	Not Available
Labour force (working-age population as % of city population)	48.76%	Not Available	Not Available
Net foreign migration (as % of city population)	0.64%	Not Available	Not Available
Household size (number of people per household)	2.80	2.70	2.63

ECONOMY	2018	2025	2035
GDP (CAD billion)	2,296.8	2,887.7	4,195.1
Employment (as a % of labour force)	96.01%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	172,466	197,899	262,817
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	1,648,711	2,019,219	2,791,669

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	3
Petty crime (prevalence of petty crime)	3
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	3
Stability (overall stability rating)	65

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

SAN FRANCISCO

Area: **6,398km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	4.86m	5.35m	6.07m
Population (city population as % of country)	1.49%	1.56%	1.66%
Gender (Male | Female as % of city population)	49.50% | 50.50%	49.60% | 50.40%	49.67% | 50.33%
Education (attained tertiary qualifications as % of city population)	54.80%	Not Available	Not Available
Labour force (working-age population as % of city population)	54.69%	Not Available	Not Available
Net foreign migration (as % of city population)	0.66%	Not Available	Not Available
Household size (number of people per household)	3.10	3.00	2.89

ECONOMY	2018	2025	2035
GDP (CAD billion)	656.6	896.2	1,442.2
Employment (as a % of labour force)	97.41%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	243,815	284,430	371,740
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	490,313	650,176	992,107

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	80

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

SEATTLE

Area: **15,209km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	3.92m	4.40m	5.13m
Population (city population as % of country)	1.20%	1.28%	1.40%
Gender (Male | Female as % of city population)	49.50% | 50.50%	49.60% | 50.40%	49.67% | 50.33%
Education (attained tertiary qualifications as % of city population)	37.50%	Not Available	Not Available
Labour force (working-age population as % of city population)	61.59%	Not Available	Not Available
Net foreign migration (as % of city population)	0.69%	Not Available	Not Available
Household size (number of people per household)	2.60	2.60	2.49

ECONOMY	2018	2025	2035
GDP (CAD billion)	467.1	636.9	1,036.0
Employment (as a % of labour force)	95.90%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	161,585	185,897	241,149
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	304,019	404,746	628,917

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	3
Stability (overall stability rating)	75

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

SEOUL

Area: **11,704km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	24.25m	24.42m	23.80m
Population (city population as % of country)	47.47%	46.76%	45.07%
Gender (Male | Female as % of city population)	49.20% | 50.80%	48.70% | 51.30%	47.95% | 52.05%
Education (attained tertiary qualifications as % of city population)	70.05%	Not Available	Not Available
Labour force (working-age population as % of city population)	74.95%	Not Available	Not Available
Net foreign migration (as % of city population)	0.30%	Not Available	Not Available
Household size (number of people per household)	2.60	2.40	2.17

ECONOMY	2018	2025	2035
GDP (CAD billion)	1,395.0	1,957.4	2,983.9
Employment (as a % of labour force)	65.69%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	63,352	79,642	121,528
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	715,053	960,955	1,562,782

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	75

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

SINGAPORE

Area: **722km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	5.79m	6.16m	6.48m
Population (city population as % of country)	100%	100%	100%
Gender (Male | Female as % of city population)	49.40% | 50.60%	49.40% | 50.60%	48.21% | 50.67%
Education (attained tertiary qualifications as % of city population)	32.20%	Not Available	Not Available
Labour force (working-age population as % of city population)	71.70%	Not Available	Not Available
Net foreign migration (as % of city population)	1.08%	Not Available	Not Available
Household size (number of people per household)	3.30	3.00	2.74

ECONOMY	2018	2025	2035
GDP (CAD billion)	692.9	953.9	1,576.1
Employment (as a % of labour force)	89.11%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	183,297	209,973	240,314
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	405,539	552,054	764,542

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	1
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

STOCKHOLM

Area: **6,779km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.41m	2.74m	3.23m
Population (city population as % of country)	24.17%	26.21%	29.49%
Gender (Male | Female as % of city population)	50.10% | 49.90%	50.20% | 49.80%	50.34% | 49.66%
Education (attained tertiary qualifications as % of city population)	26.11%	Not Available	Not Available
Labour force (working-age population as % of city population)	68.54%	Not Available	Not Available
Net foreign migration (as % of city population)	0.98%	Not Available	Not Available
Household size (number of people per household)	2.40	2.40	2.37

ECONOMY	2018	2025	2035
GDP (CAD billion)	239.4	331.1	517.5
Employment (as a % of labour force)	68.28%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	94,237	116,372	146,756
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	107,567	150,396	224,411

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	1
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	90

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

SYDNEY

Area: **4,196km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	4.63m	5.01m	5.54m
Population (city population as % of country)	18.69%	18.66%	18.76%
Gender (Male | Female as % of city population)	49.80% | 50.20%	49.80% | 50.20%	49.72% | 50.28%
Education (attained tertiary qualifications as % of city population)	23.08%	Not Available	Not Available
Labour force (working-age population as % of city population)	70.10%	Not Available	Not Available
Net foreign migration (as % of city population)	1.87%	Not Available	Not Available
Household size (number of people per household)	3.00	3.00	2.95

ECONOMY	2018	2025	2035
GDP (CAD billion)	339.4	471.4	746.1
Employment (as a % of labour force)	71.37%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	111,696	136,932	181,867
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	210,321	280,205	414,259

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	85

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

TORONTO

Area: **5,906km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	6.26m	6.71m	7.16m
Population (city population as % of country)	16.93%	17.13%	17.09%
Gender (Male | Female as % of city population)	49.60% | 50.40%	49.70% | 50.30%	49.73% | 50.27%
Education (attained tertiary qualifications as % of city population)	42%	Not Available	Not Available
Labour force (working-age population as % of city population)	66.97%	Not Available	Not Available
Net foreign migration (as % of city population)	1.78%	Not Available	Not Available
Household size (number of people per household)	2.90	2.80	2.67

ECONOMY	2018	2025	2035
GDP (CAD billion)	406.9	535.5	797.8
Employment (as a % of labour force)	92.67%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	93,263	104,585	134,100
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	241,640	302,280	428,042

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	1
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	100

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

VANCOUVER

Area: **2,883km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	2.60m	2.81m	3.03m
Population (city population as % of country)	7.03%	7.16%	7.24%
Gender (Male | Female as % of city population)	49.60% | 50.40%	49.70% | 50.30%	49.73% | 50.27%
Education (attained tertiary qualifications as % of city population)	38%	Not Available	Not Available
Labour force (working-age population as % of city population)	65.53%	Not Available	Not Available
Net foreign migration (as % of city population)	1.27%	Not Available	Not Available
Household size (number of people per household)	2.70	2.60	2.51

ECONOMY	2018	2025	2035
GDP (CAD billion)	174.9	233.5	353.9
Employment (as a % of labour force)	94.32%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	95,733	107,979	138,833
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	109,797	139,169	200,235

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	1
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	1
Civil unrest (threat of civil unrest)	1
Stability (overall stability rating)	95

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

WASHINGTON DC

Area: **16,171km²**

POPULATION & DEMOGRAPHY	2018	2025	2035
Population	6.31m	6.85m	7.60m
Population (city population as % of country)	1.93%	1.99%	2.08%
Gender (Male | Female as % of city population)	49.50% | 50.50%	49.60% | 50.40%	49.67% | 50.33%
Education (attained tertiary qualifications as % of city population)	55.40%	Not Available	Not Available
Labour force (working-age population as % of city population)	52.18%	Not Available	Not Available
Net foreign migration (as % of city population)	0.62%	Not Available	Not Available
Household size (number of people per household)	2.60	2.60	2.49

ECONOMY	2018	2025	2035
GDP (CAD billion)	722.3	962.3	1,518.4
Employment (as a % of labour force)	94.32%	Not Available	Not Available
Median household income (CAD median nominal disposable income at Purchasing Power Parity (PPP), earned by households - per individual)	165,358	190,170	249,982
Personal disposable income (CAD million, total value of personal income after taxes and deductions at PPP - per city)	507,052	652,787	967,797

Currency converted from USD to CAD 28.05.2018, courtesy of Bank of Canada at 1 USD = 1.3 CAD

STABILITY	2017
Terrorism (threat of terrorism)	2
Petty crime (prevalence of petty crime)	2
Violent crime (prevalence of violent crime)	2
Civil unrest (threat of civil unrest)	2
Stability (overall stability rating)	80

Rating scale from 1 to 5. *1 = Acceptable; 2 = Tolerable; 3 = Uncomfortable; 4 = Undesirable; and 5 = Intolerable.* ***Rating scale for overall Stability,*** *100 = Ideal.*

GLOSSARY

A

Artificial Intelligence (AI)
Auckland Transport (AT)
Auckland Transport Alignment Project (ATAP)

B

Baltimore/Washington International Thurgood Marshall Airport (BWI)
Brisbane Airport Corporation (BAC)
Brisbane City Council (BCC)
British Columbia (BC)
Broadband over LTE (BoLTE)
Building and Construction Authority (BCA)

C

Calgary International Airport (YYC)
Central Business District (CBD)
City of Edinburgh Council (EEC)
Comprehensive Parking Management Plans (CPMPs)
Connected Traffic Management Center (TMC)

D

DC Public School (DCPS)
Delhi Transport Corporation (DTC)
Delhi Urban Shelter Improvement Board (DUSIB)
Demand Responsive Transport (DRT)
Department of General Services (DGS)
Department of Parks and Recreation (DPR)
Department of Public Works (DPW)
Digital Economy Work Plan (DEWP)
Digital Infrastructure Fund (DIFF)
District Department of Transportation (DDOT)

E

Energy Market Authority (EMA)
European Union (EU)

F

Freight Master plan (FMP)

G

General Data Protection Regulation (GDPR)
Greater London Authority (GLA)
Green Area Ratio (GAR)

H

Housing Development Board (HDB)
Housing Production Trust Fund (HPTF)

I

Industry Transformation Map (ITM)
Info-communications Media Development Authority (IMDA)
Information Security Program and Division (ISP Division)
Inland Container Depots (ICD)
Interstate Commission on the Potomac River Basin (ICPRB)

L

Land Transport Authority (LTA)

M

Mandatory Housing Affordability (MHA)
Manufacturing/Industrial Center (MIC)
Mass Rapid Transit (MRT)
Mayoral Development Corporation (MDC)
Metropolitan Land Use and Development Plan (PMAD)
Miles per Hour (mph)
Ministry of Business, Innovation and Employment (MBIE)
Ministry of Health (MOH)
Ministry of Mines and Energy (MME)
Ministry of Urban Development and Housing (SEDUVI)
Mobility Operating Systems (MOS)
Montreal Metropolitan (CMM)
Montreal Metropolitan Logistics and Transportation Cluster (CargoM)

N

National Capital Region (NCR)
National Capital Territory (NCT)
National Carbon Offset Standard (NCOS)
National Green Tribunal (NGT)
National Parks Board (NParks)
New Central Library (NCL)
New Delhi Municipal Council (NDMC)
New York City (NYC)
New Zealand Information Security Manual (NZISM)
Next Generation Nationwide Broadband Network (Next Gen NBN)
Non-Governmental Organizations (NGOs)

O

Office for the Promotion of Investment for Energy Sustainability (OFISECDMX)
Office of the Chief Technology Officer (OCTO)

P

Pennsylvania Avenue 2040 Project (PA2040)
Personal Data Protection Act (PDPA)
Potomac River Basin Drinking Water Source Protection Partnership (Partnership)
Public Utilities Board (PUB)

Q

Queensland Urban Utilities (QUU)

R

Reclaimed Water (NEWater)
Reduce, Reuse, Recycle (3Rs)
Regional Organization of Councils (ROC)
Remotely Piloted Aircraft Systems (RPAS)
Research and Development (R&D)

S

Seattle City Light SCL)
Seattle Department of Transportation's (SDOT)
Seattle Parks and Recreation (SPR)
Seattle Public Schools (SPS)
Seattle Public Utilities (SPU)
Seattle-Tacoma International Airport (Sea-Tac)
Singapore Packaging Agreement (SPA)
Société de Transport of Montreal (STM)
South East Queensland (SEQ)

T

Tamaki Transformational Program (TTP)
The City Data Exchange (CDE)
Department of Transport and Main Roads (TMR)
The Southern Initiative (TSI)
Transit-Oriented Development (TOD)
Transport Network Company (TNC)

U

United Kingdom (UK)
United Utilities (UU)
Unmanned Aerial Vehicles (UAVs)
Unmanned Aircraft Systems (UAS)
Urban Redevelopment Authority (URA)

V

Vehicle to Infrastructure (V2I)

W

Washington Metropolitan Area Transit Authority (WMATA)

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