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.

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.

AT A GLANCE

RANKED 02
CITY SCORE 29.52

PLACES 6.0/10
MOBILITY 7.5/10
TECHNOLOGY 7.7/10
URBAN SYSTEMS 6.4/10

COPENHAGEN
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.
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 2021. 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 25 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 handling rainwater on the property and consequently of the properties by 27 per cent. In addition to reducing energy spent on cooling buildings and factories, the renovation also reduced heat-island effects, lowering the buildings’ CO2 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 TRANSPORT**

**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 fit 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-Malmö 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 Malmö 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 Malmö 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 90 airlines.

The airport serves more than 25 million passengers each year, most of whom (85.5 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 Conde 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 30-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 a 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 board. To further facilitate this, 35 per cent of the city’s public transport fleet is bicycle-friendly. 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.

BUILT FORM: PARKING PROVISIONS

SCORE: 7.5/10

Motors 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 1980s. 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 8:00pm 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

SCORE: 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 642.05 Mbps for uploads and 582.70 Mbps for downloads.

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

**SCORE: 9.0/10**

Ninety-eight percent of Denmark’s population has a 4G LTE connection, and in June 5G was rolled out. Mobile broadband is the province of four telecoms: 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 22.50 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 CAD80,000 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 integrate multiple sources of information to meet the challenges of sustainability and quality of life.

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 CAD20 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.

**URBAN SYSTEMS**

**SCORE: 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 drive 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.

**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 2 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, biodegradable 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 590 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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