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Executive summary

Our SmartCitiesWorld City Profiles explore the world’s leading cities as they use technology and smarter approaches to deliver better services and improve quality of life for citizens.

The UN predicts that by 2050, 70 per cent of the world’s population will live in urban areas. Every week, another 1.5 million people around the globe move into a city. For city administrators, this growth, encouraged – and accompanied – by unprecedented technological change, presents a myriad of challenges and opportunities, big and small, social and economic, human and technical, logistical and environmental.

This series examines individual cities, identifying their most pressing issues and how technological innovation is helping to manage them.

Barcelona

In this edition, we focus on Barcelona, the second-largest city in Spain, one of Europe’s leading cultural, economic and financial centres and an important transport and logistics hub.

Known for its Mediterranean climate and cuisine, Modernist architecture, art, entertainment, sports and a thriving high-tech and entrepreneurial scene, Barcelona has grown since the 1992 Olympic Games into a vibrant global city. Since the emergence of the smart city concept, Barcelona positioned itself as a model of smart city planning, ecosystem development and urban improvements to benefit its diverse population.

In the early days of the 21st century, Barcelona’s local government approved the 22@ project which focused on the transformation of an urban area filled with abandoned factories and warehouses and low-value-added economic activities. A recent study by Aretian, an urban analytics and design firm, analysed innovation districts and industry clusters operating in the Barcelona metropolitan area and found that Barcelona “has had remarkable success in consolidating the municipal-led 22@ Innovation District in less than two decades, because it has a much higher innovation intensity” than the top innovation districts in the United States.

When the ‘smart city’ was an embryonic idea, Barcelona was busy deploying responsive technologies across urban systems such as public transit, parking, street lighting and waste management. Today, after many years of smart city development and recognition as a leader in techno-centric innovation, Barcelona’s leaders are committed to another ground-breaking vision of a new economic, social and environmental model. By implementing this vision on a broad scale, the city intends to give more power to citizens while protecting their digital rights and applying digital strengths to solve urban problems.
Introduction

Barcelona is admired as a pioneering city in terms of building one of the earliest and most successful smart city models. Through a process of re-examining its strategy in relation to citizens’ most pressing issues, Barcelona evolved from an early technocratic vision to a new strategy for delivering “power to the people”. This strategy, spearheaded by Francesca Bria, the city’s former Commissioner for Digital Technology and Innovation, set Barcelona on a path toward digital democracy and democratic innovation.

The city’s strategy and goals – defined in its Barcelona Digital City plan – are ambitious and multi-dimensional, as evidenced by the breadth and depth of projects in open, collaborative and transparent government, democratisation of urban technologies, a new social pact on urban data, a digital innovation ecosystem and digital social innovation. In Bria’s view: “The digital revolution must serve the many and not just the few.”

By moving toward the new vision, Barcelona is making a commitment to place citizens’ needs “at the centre of the digital agenda.” Rather than following the path of technology-push – focused only on sensor networks, gadgets and connectivity – the city’s evolving strategy is to invest in infrastructure that enables high-quality public-service delivery and a more sustainable and collaborative society.

MOBILITY
- Barcelona has six types of public transport: bus, metro, light rail, train, cable car and funicular, operated by multiple transit agencies
- Barcelona is the leading city in Spain in terms of registered electric vehicles
- According to the 2018 INRIX Global Traffic Scorecard, the city is ranked as the 38th most-congested city in the world

CITY CHALLENGES
- Barcelona is working to reduce carbon emissions. The European Commission recently threatened to take Spain to the European Court of Justice (ECJ) for exceeding air pollution limits in Barcelona
- According to recent headlines, Barcelona is in the midst of a crime wave, with statistics indicating crime in the streets increased by 17 per cent in 2018 and 9 per cent in the first half of 2019 – largely as a result of pickpocket gangs
- Like many other cities, Barcelona faces a homelessness challenge, with an estimated 3,000 people living and sleeping in the streets or in social centres each day

ECONOMY
- Business services, commerce, ICT, transport, healthcare and tourism are among the main branches of economic activity in the city
- Barcelona is ranked ninth in the world for attracting foreign investment. Approximately 8,600 foreign companies have their headquarters in Barcelona and Catalonia (with 36 per cent from Germany, France and the US)
The digital revolution must serve the many and not just the few.

Barcelona has long been a champion of citizens’ rights around data privacy and protection. Since 2014, Barcelona citizens have had the right to request public information. To empower citizens by giving them access to public data, the City Council established its Open Data portal, which includes more than 450 reusable datasets. The City Council recently released planned measures for open digitisation, including:

- Introduction of agile development methodologies for user-centred digital services
- Responsible and ethical data strategy
- Technological sovereignty and migration to free software
- Transformation of public procurement

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Barcelona’s Data Commons policy, stating that data represents shared public infrastructure, led to the city’s quest to move toward becoming an experimental city - a “city as an innovation lab” - and placed citizens at the centre of this emerging paradigm. It means increasing citizens’ digital sovereignty, freedom, data protection, privacy and information self-determination.

Barcelona’s civic leaders recognise that a digital society is built with citizens and by citizens and that municipal policies should therefore promote the use of technology tools to facilitate active democracy. Decidim, a digital platform for citizen participation created using open-source software, is one of Barcelona’s tools for experimenting with participatory democracy. Decidim has collected and adopted over 9,000 citizen proposals.

“Data

The digital revolution must serve the many and not just the few.”

Francesca Bria, former Commissioner for Digital Technology and Innovation, Barcelona.
Barcelona wants to “create a new powerful vision where technology is an instrument to empower the people.”

**Toward a new smart city paradigm**

Barcelona’s priority is to reach beyond a conventional smart city paradigm (i.e. one involving investments in digital technologies before knowing how they will benefit urban residents) to “create a new powerful vision where technology is an instrument to empower the people and transform the city.” Barcelona plans a transition to technological sovereignty that enables government and citizens to cooperate, share data and ideas, and work together in creating urban solutions and services. It is a vision in which citizens articulate their own priorities on innovation and make decisions on the use of data and quality-of-life improvements.

Implementing this new approach means the city is evolving from a top-down planning process to a bottom-up, citizen-driven approach, while “promoting collective intelligence and involving all the key players in the city’s innovation ecosystem.”

City leaders believe that – with appropriate public policies – technology should be a driving force that enables a more inclusive and sustainable economy, narrows the digital divide and reduces inequalities. The recently formed Data Analytics Office is one of the city’s actions in this direction – with a mission to deliver actionable insight for local government, support more innovative public service delivery, develop big data and data analytics projects and promote a collaborative society.

**DATA**

- Since its launch in 2016, more than 31,000 people have joined the Decidim citizen participation platform, submitted 12,520 proposals and cast 190,000+ votes or supports to proposals
- Barcelona’s Open Data Portal includes more than 450 reusable datasets
- In 2018, Barcelona established its first Data Analytics Office

**Over 9,000 citizen proposals collected and implemented via Decidim**
July 2011: Barcelona is chosen as the GSMA Mobile World Capital and site of the Mobile World Congress through 2023.

November 2011: The first Smart City Expo (SCEWC) is held in Barcelona, establishing itself as a leading event and drawing more than 6,000 visitors from 50 countries.

November 2012: Barcelona’s City Council and the Municipal Institute of Informatics (IMI) announce Sentilo, an open-source software sensor project and cross-platform solution.

December 2012: Barcelona City Council publishes the Citizen Commitment to Sustainability 2012-2022.

March 2014: Barcelona is voted European Capital of Innovation.

January 2015: Barcelona is named as one of three lighthouse cities in the EU Grow Smarter project, aiming to integrate smart city solutions in energy, infrastructure and transport.

February 2015: Juniper Research ranks Barcelona as the smartest city in the world.
Connectivity

To meet UN objectives for sustainable development, cities need digital and technological infrastructure. In a Networked Society City Index report, Barcelona leapt five positions in global rankings of technological maturity and sustainability to become one of the top fifteen cities in the world.

Barcelona Wi-Fi is a Barcelona City Council service that enables citizens to connect to the Internet through Wi-Fi hotspots in municipal locations and public access points. With the goal of making it easier for citizens to make this technology part of their lives, the municipal Wi-Fi service provides online access to local government information and procedures.

Barcelona’s government has been a leader in the deployment of fibre optics, with its first investment to connect municipal buildings in the 1980s. Local government innovators in Viladecans, a town in the province of Barcelona, started investing in fibre-optic infrastructure more than 15 years ago. This investment led to the deployment of an extensive municipal area network on which smart city services are being tested and launched through public-private cooperation. As a result, the town is well known as a model for how to develop the technology strengths needed to implement a smart city strategy.

Europe’s 5G innovation hub

In July 2019, Barcelona was named as Europe’s 5G innovation hub, a unique open laboratory environment for 5G experimentation available to any local or international institution that needs to validate 5G services and solutions in research and pre-commercial stages. Jordi Puigneró, Minister for Digital Policy and Public Administration, announced an agreement – known as the 5G Barcelona Alliance – between Orange, i2CAT, the Polytechnic University of Catalonia (UPC) and Mobile World Capital, in which Orange will make spectrum available for 5G pilot projects.

Mobile World Congress: A catalyst for local innovation

As the home of the Mobile World Congress (MWC) and Smart City Expo World Congress, Barcelona strives to build and maintain broadband and wireless networking strengths, reflecting its position as a global facilitator and meeting point for the world’s leading technology companies. In a previous edition of MWC, the City of Barcelona partnered with the GSMA and the Barcelona International Trade Fair in a Wireless Broadband Alliance (WBA) project to launch the Passpoint system – a network of next-generation hotspots (NGH) – and demonstrate how advanced wireless hotspots enable smart city connectivity.

To deliver advanced connectivity for the 100,000+ visitors, more than 2,200 Wi-Fi Access Points (APs) were installed at the International Trade Fair conference centre, Barcelona-El Prat Airport, railway stations and city attractions.

Nearly 20 per cent of MWC attendees connected to Wi-Fi through the NGH network, surpassing all previous deployments in Barcelona. The NGH network, a significant innovation in smart city connectivity, carried more than 2.3 terrabytes of data and delivered speeds up to 25Mbps. NGH is viewed as a critical framework for developing smart cities with universal internet connectivity.

“With Passpoint, Barcelona got smart and gave us a glimpse into the future of connected cities,” said Derek Peterson, WBA board member and CTO at Boingo Wireless.

In July 2019, Barcelona was named as Europe’s 5G innovation hub.
Transportation

In 2018, the European Institute of Innovation and Technology (EIT) selected the MOBILUS consortium – led by the City of Barcelona and the Polytechnic University of Catalonia (UPC) – to develop an innovation hub and community in urban mobility. “The fact that Barcelona was chosen for this European project is specific recognition of the urban mobility policies we are already carrying out,” said Mayor Ada Colau in a speech in which she emphasised the city’s policies and commitment to public transport in general, an expansion in the number of bicycle lanes and a new bus network.

Barcelona’s residents and visitors benefit from a modern transport system that delivers mobility services and a city-wide network of buses, metros, trams and suburban rail services. Early this year, Barcelona launched Smou, a new mobility app aimed at improving the customer experience by integrating several of the city’s mobility services such as smart parking and electric charging points.

The city’s public transport system operates a zone-based ticketing system with unified fare integration throughout the metropolitan area. Data from the Metropolitan Transport Authority (ATM) indicates that all modes of Barcelona’s public transport recorded higher demand in 2018. The total number of integrated rail and bus journeys increased by four percent to 1.025 billion, reaching a target originally set for 2020.

However, the city is still highly car-centric and often jammed with privately owned vehicles during peak traffic periods. While the city’s population has remained relatively stable in recent years, private vehicle ownership and car and motorcycle density have increased, leading to increased carbon emissions and shortfalls in green space (estimated at 3 to 6 sqm per resident, far below WHO recommendations).

An evolving urban mobility strategy
These challenges place pressures on urban transport planners to reduce the number of motorised vehicles and develop new mobility and traffic solutions. As Mayor Colau explains: “These are times of so many changes, occurring so fast (especially technologies), that it is difficult to know what mobility will look like in ten years. There are certain to be huge changes, but they will need to produce healthier and more sustainable outcomes. We cannot go on as we are. The lives of our citizens and their health are at stake.”

Barcelona’s transportation objectives, as outlined in its Urban Mobility Plan, are to reduce environmental pollution attributable to transport, increase pedestrian mobility and safety, reduce the
use of cars and other motorised vehicles, increase the use of sustainable mobility and improve the liveability of urban space.

Low-emission zones in the city restrict the use of the highest-polluting vehicles. These restrictions, taken to combat the harmful effects of pollution, were accompanied by other steps to improve sustainable mobility, such as:

• Promoting the benefits of public transport
• Ensuring all public transport modes operate at maximum capacity during peak traffic and high-pollution episodes
• Launching a website to clarify restrictions of low-emission zones.

Superblocks
Sometimes an innovator’s vision, especially an audacious one with far-reaching implications, takes a while to gain traction. This is certainly true in the case of Salvador Rueda, founder and Director of the Urban Ecology Agency of Barcelona, who envisioned the city not being dominated by cars and other motorised vehicles. His vision of “urban superblocks” – with pedestrian-and-cyclist-friendly mobility, reductions in motorised vehicles and healthier mixed-use public spaces – emerged over a period of years. Rueda’s idea is that each resident should have access to their own superblock and ease of travel through the city “without the need for, or fear of, motorised private vehicles.” Although this vision does not call for elimination of private cars, it could drastically reduce their usage and make more urban space available for green, liveable areas and innovative bicycle and transit services.

Leadership and smart mobility
In some situations, innovators must find ways to leapfrog conventional thinking, and this occurred in Barcelona’s discovery of new charging solutions during participation in the GrowSmarter project, one of Europe’s Smart City and Community (SCC1) projects funded under the Horizon 2020 programme.

Gonzalo Cabezas, from Barcelona’s Institute of Municipal Informatics (IMI) and the city’s GrowSmarter Site Manager explains: “As partners in the GrowSmarter ecosystem, Nissan and the Catalonia Institute for Energy Research (IREC) had to technically challenge current market solutions” when creating an urban solution involving integration of vehicle-to-building (V2B) stations, electric vehicles (EVs), solar panels, battery storage and an energy management unit.

This integration of charging infrastructure for electric vehicles and buildings aims to facilitate the transition from conventional to electric vehicle fleets and allows integration with local renewable energy sources.

CHILD-FRIENDLY MOBILITY
Barcelona plans multiple actions around schools to protect children’s health:

• Street calming to reduce traffic around 27 schools
• Improved air quality at 85 schools
• 11 new projects to create climate refuges
March 2017: Barcelona releases the Special Tourist Accommodation Plan (PEUAT) to regulate the introduction of tourist accommodation establishments.

December 2017: Barcelona’s Noise and Health Working Group holds its first meeting to discuss the health impact of noise pollution and identify possible solutions.


February 2018: Barcelona begins the planning process for its Urban Mobility Plan 2019-2024, with milestones for increasing pedestrian mobility and safety while reducing motorised transport.

February 2018: Barcelona establishes a Data Analytics Office to provide analysis and predictions covering all aspects of managing city resources and services.

April 2018: Mayor Colau sets an aggressive target to cut emissions by 45% by 2030 and calls for EU subsidies for clean vehicles.

TRANSPORT

- The total number of integrated rail and bus journeys in Barcelona increased by 4 per cent to 1.025 billion in 2018.
- The Metropolitan Transport of Barcelona (TMB) plans to acquire 250 lower-pollution buses, 116 of which will be electric.
- Use of e-scooters has increased to an estimated 19 per cent of riders in bike lanes during peak weekday hours.

15 per cent of Spain’s EVs are in Barcelona

According to a report issued by the General Directorate of Traffic Services, Barcelona is a leader in the number of registered electric vehicles in Spain. The official data reveals that 40 per cent of the total EVs are in Catalonia, with 15 per cent concentrated in Barcelona.

LIVE Barcelona, a public-private sector consortium in sustainable mobility, promotes the use of low-emission vehicles in Barcelona and offers subsidies for the purchase of electric vehicles, installation of charge points or support for investments in eco-friendly vehicle fleets.

Barcelona will soon be the latest city to add a large number of electric buses to its public transport fleet. To replace an aging fleet of diesel and other high-polluting vehicles, the European Investment Bank (EIB) is granting a €73.5 million loan to Metropolitan Transport of Barcelona (TMB) for acquisition of 250 lower-pollution buses, 116 of which will be electric.

Barcelona citizens and tourists also use a wide range of alternative transport modes such as cycling, bike-sharing services, e-bikes, mopeds, Segways and e-scooters. Private ownership and use of e-scooters is allowed under the City Council’s safety rules and restrictions. Use of e-scooters has increased to an estimated 19 per cent of riders in bike lanes during peak weekday hours (and up to 30 per cent in some locations). However, Barcelona authorities have implemented strict rules around e-scooter sharing services to boost safety and minimise disruption.

Ride-hailing companies encountered a turbulent regulatory and competitive situation when entering the Barcelona market. In 2018, Spanish taxi drivers went on strike, demanding that authorities restrain the activities of ride-hailing operators. Cabify and Uber suspended operations in Barcelona in early 2019 after regulators responded to taxi driver protests and established new rules affecting ride-hailing operations. Cabify returned to the Barcelona market in March of this year after finding a regulatory loophole. In May, a Barcelona association of taxi drivers announced its intention to file a legal complaint against the ride-hailing operators for alleged fraud and other offences.

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Through Barcelona’s strategy for renewable energy, innovative street lighting, participation in EU energy programmes and commitment to residential initiatives, the city is advancing steadily toward energy sustainability goals.

Barcelona’s Energy Agency is working to boost the city’s reputation as “a benchmark city in dealing with energy issues and their environmental consequences”. The Agency’s goal is to ensure optimisation of the management and use of energy resources and to promote sustainable energy.

**Renewable energy**
Renewable energy is one of the main ingredients in Barcelona’s plans. Barcelona Energia, a publicly owned metropolitan energy distributor, delivers certified renewable energy and supplies energy for street lighting, traffic lights, public housing, municipal buildings and sports centres. Early this year, it extended electricity services to 20,000 homes. This is a big step toward promoting a shift to energy sovereignty.

Barcelona’s programme for increasing the use of solar energy is the government’s tool for boosting the number of renewable facilities in the city. “The aim behind self-production and self-consumption is feasible, and there is a pressing need for everyone to commit themselves to implementing these initiatives,” said Janet Sanz, Deputy Mayor for Ecology, Urban Planning and Mobility, on the city hall website.

Barcelona’s lighting strategy aims to increase energy-efficiency, security and smart lighting management while providing improved environmental quality, visibility and luminosity. The city’s lighting priorities include pedestrian lighting enhancements and installation of more than 10,000 new LED lights in over 200 streets.

**Smart living**
Barcelona is one of three cities participating in Europe’s GrowSmarter project to integrate and demonstrate smart solutions for urban challenges such as reducing residential energy consumption.
After the City Council ran a campaign to encourage citizens to decrease their electricity consumption, it launched the Virtual Energy Advisor, a free platform — based on a GrowSmarter project — to visualise energy usage. This tool was provided to 450 citizens and advises them on how to optimise behaviour to achieve maximum energy efficiency and reduce their bills.

In the private sector, energy services company Naturgy developed a home energy management system (HEMS). “Within GrowSmarter, the HEMS platform was distributed to users in different buildings in Barcelona. The platform is managed by a tablet or smartphone and, apart from the standard monitoring features, includes visualisation of electricity self-generation via photovoltaics,” said Gonzalo Cabezas, GrowSmarter Site Manager in Barcelona. “Both solutions have been evaluated and reported energy savings between 15 to 27 per cent.”

Recognising that a city’s existing building stock is a major contributor to energy consumption, Barcelona’s energy actions – in conjunction with the GrowSmarter project – include sustainable retrofit solutions. To facilitate the move toward a smarter energy model, 34,000 sqm of housing is being retrofitted in Barcelona through public-private partnerships.

Through the Housing Consortium of Barcelona, financial assistance is available for housing retrofits. Homeowners seeking to improve their property can receive monetary aid for upgrading insulation and heating, ventilation and air conditioning (HVAC) equipment or to install a renewable energy source such as solar photovoltaic systems.

**ENERGY**

- Installation of a photovoltaic facility at the San Agustín Civic Centre aims to generate about 40,000 kWh of electricity annually (for energy self-consumption)

- All new municipal facilities to be renovated will get solar panelling to generate energy, cut CO2 emissions and promote the use of renewables. The city also plans to issue tenders for 30 solar generation projects

- A new lighting renewal strategy for the city includes installation of more than 10,000 lights in 200+ streets

**Barcelona is one of three cities participating in Europe’s GrowSmarter project.**
In 2018, Barcelona and New York City launched an international Affordable Housing Challenge at the Smart City Expo, with the goal of discovering innovative approaches to make housing more affordable. The competition was organised by the i.lab programme of the Commissioner for Technology and Digital Innovation, the Barcelona City Councillor’s Office for Housing and Renovation and New York City Council.

In 2019, a joint proposal for ‘densifying’ cities by making the most of vacant spaces — submitted by Columbia National University and Straddle 3 Barcelona — was selected as the winner of this competition. The idea involves renovating existing buildings and new constructions without affecting the site through new, economical building techniques that are light, adaptable and quick to install.

Barcelona’s housing objective is to facilitate access to affordable housing through policy innovation and address challenges such as gentrification and socio-spatial segregation. Although Barcelona’s public housing stock is low by European standards (1.5 per cent of the total housing stock versus 28 per cent in Berlin), the city claims it will double the number of public housing units within the next decade.

Commitment22 is an initiative to make municipal buildings and operations more environmentally sustainable and energy-
efficiency. Barcelona implemented urban policies for green building codes, green municipal buildings and green schools.

Its Diagonal 640 building (an office building of 28,400 sqm) received LEED green building certification with a design that produced favourable outcomes in reduced water consumption, improved indoor environment, energy-efficient operations and responsible waste management.

22@ Innovation District
In the early years of the 21st century, Barcelona’s civic leaders approved plans for the 22@ Innovation District with a grand vision to transform an area occupied by abandoned factories, warehouses and underutilized urban space. The City’s 22@ objective is to renew Poblenou, a former industrial neighbourhood, in the district of Sant Martí (once known as “the Catalan Manchester”). Still an ongoing project, 22@ should ultimately create an estimated four million sqm of new floor space, 3.2 million of which will be used for “productive activities” and 800,000 for housing and services.

The 22@ programme aims to show how urban innovators can develop a mixed-use model which “favours social cohesion and fosters balanced and sustainable economic development.”
Demographics

With a population of 1.6 million, Barcelona’s metropolitan area extends to other municipalities in the Province of Barcelona and is home to an estimated 4.8 million people, making it the sixth-most populous urban area in the EU. Foreign nationals represent about 12 per cent of the population.

Quality of life
To maintain a high quality of life, Barcelona strives to ensure welfare policies and new opportunities contribute to the wellbeing of all citizens. The Citizen Accord for an Inclusive Barcelona includes a strategy for social inclusion and reduction of inequality. The most recent measures include those targeted at fighting poverty, increasing the social housing supply, improving work conditions and promoting a neighbourhood economy.

With an estimated 16,000 inhabitants per km², Barcelona is the fourth-most densely populated city in Europe – a factor that contributes to congestion and noise pollution issues and serves as a force for innovation in smart mobility, noise control and housing.

Tourism: A double-edged sword
Tourism plays an important role in Barcelona’s economy and has a major impact on employment. With its internationally renowned attractions, sports and conference venues, Barcelona attracts around 20 million tourists per year.

Like many popular travel destinations, the city discovered to its dismay that a growing influx of visitors can lead to problems for residents who live and work in the city. Parts of the historic city centre, with its well-preserved medieval structure and streets, have been inundated by growth in tourism.

This has led some long-term residents to complain that their neighbourhoods are being taken over by souvenir shops and coffee chains. In the past two years, the Barcelona City Council has taken action against fraudulent rental practices and started more than 13,000 legal proceedings for infraction of tourism laws.

Homelessness and the search for solutions
Unfortunately, over 3,000 people in Barcelona are homeless, including 956 sleeping in the streets and 2,099 housed in social service centres.

“Not only is it necessary to focus on the people who sleep on the street, but also on the structural factors that lead to homelessness,” Maite Mauricio, a representative of XAPSLL (Xarxa d’Atenció a Persones Sense Llar), the city’s Network of Homeless Services, told Catalan News last year. The XAPSSL – a network of 26 social service entities with the Barcelona City Council as its main driver – was established to aid homeless citizens and identify homelessness problems. Its objectives include:

• Sharing knowledge and experience to improve services and resources for the homeless
• Accompanying homeless people in the process of regaining their autonomy
• Coordinating local projects, promoting innovation and raising awareness of homelessness challenges.

Barcelona: 20 million tourists per year

DEMOGRAPHICS

• Barcelona is the fourth-most densely populated city in Europe, with an estimated 16,000 inhabitants per km²
• 24 per cent of Barcelona’s population is at risk of poverty or social exclusion, with a higher incidence among women than men and young people between the ages of 16 and 24 being the most vulnerable in this regard
• The rate of employment or economic activity is 74.4 per cent, while unemployment stands at 12.7 per cent.

“Not only is it necessary to focus on the people who sleep on the street, but also on the structural factors that lead to homelessness.”
A key factor in Barcelona’s success as a smart city is its enduring strength as a centre of research, knowledge and innovation. In a study by the Polytechnic University of Catalonia, Barcelona ranked fifth in Europe and 18th worldwide for scientific production. The city has several world-class universities, with smart city studies at the University of Barcelona, the Polytechnic University of Catalonia (UPC), the Bau Design College of Barcelona and the University of Ramon Llull.

Barcelona holds a position as a city of excellence in business training; the only city with two institutions – ESADE and IESE – rated among the five top business schools in Europe.

Barcelona has an estimated 1.1 million jobs, with more than 50 per cent in knowledge-intensive activities. Approximately 46,000 professionals are dedicated to research and development. Many of these work in technologies applicable to smart city innovation, such as artificial intelligence, virtual reality, smart mobility, renewable energy, biomedicine and healthcare, smart buildings and fire protection.

Events such as Mobile World Congress (MWC) and Smart City Expo World Congress (SCEWC) are among the reasons that Barcelona is a leader in creating a world-class smart ecosystem. “The Smart City Expo contributes to Barcelona’s success as a smart city,” says Esther Fuldauer, the Expo’s Community Manager. “By attracting industry visionaries, city leaders, entrepreneurs and thought leaders from throughout the world – and creating a collaborative climate for sharing ideas and knowledge – the Expo is part of Barcelona’s smart city ecosystem.”

As a result of its smart city achievements, Barcelona has one of the leading ecosystems in Europe for digital entrepreneurship. According to the 2018 Innovation Cities Index, the city is ranked as the eighth-most innovative city in Europe and 30th in the world. Atomico, a British consultancy, ranks Barcelona as the third-favourite EU city for establishing start-ups. Barcelona Tech City, a non-profit entity, has the mission of positioning the city as one of the world’s most important tech hubs. Early this year, more
than 1,200 of Europe's high-profile start-up founders, venture capital investors, business angels and accelerators gathered in Barcelona for networking, knowledge-sharing and deal-making at the EU Startups Annual Summit.

Barcelona Activa, the city's economic development agency, supports small businesses and start-ups by promoting entrepreneurship and employment opportunities, especially in the ICT sector. With four business incubators, Barcelona Activa provides information and training, logistics and administrative support and access to business networks and funding.

CENIT, the Catalan Centre for Innovation in Transport, is a research centre with a leading role in mobility measures, developed through Barcelona's participation in the Grow Smarter project. For Barcelona's urban planning, CENIT provides expertise in data analytics to evaluate the microdistribution of freight and simulations of traffic scenarios to improve traffic flow and reduce congestion.

The Barcelona Science and Technology Diplomacy Hub (SciTech DiploHub), is a non-profit initiative aspiring to make Barcelona “the first city in the world to implement a science and technology diplomacy strategy” and a global influence in applying science and technology to the world's major challenges.

“The Smart City Expo contributes to Barcelona’s success as a smart city.”

SKILLS

- Barcelona has more than 54,000 jobs and 2,700 companies in the ICT sector. Creative activities account for an estimated 130,000 jobs, representing 12 per cent of total employment
- Barcelona's universities have an estimated 205,000 students, with more than 50,000 enrolled in masters and PhD programmes
- The city was rated as the eighth most innovative metropolis in Europe, according to Innovation Cities Index 2018

Barcelona has an estimated 1.1 million jobs
Conclusion

With increased awareness that citizens are not simply the beneficiaries of interventions to improve life in the city but rather a rich source of co-creating urban innovation, Barcelona is moving forward in the implementation of its vision with citizen-centric projects. It wants to enable citizens to take greater control of their data and ensure the city uses its data for quality-of-life improvements. The city’s journey to arrive at a new municipal vision required a fusion of insightful leadership, talent acquisition, citizen participation and an innovative ecosystem.

Barcelona serves as an example of how a city – after making significant investments in smart infrastructure – can shift from one strategic path to another. In the early years of the smart city movement, Barcelona was a leader in deploying sensor networks and other urban technologies. Then came a period of visionary thinking and policy-making on digital rights, data sovereignty, social inclusion, citizen participation and democratic innovation.

Is Barcelona destined to serve as a global model for urban strategists and urban problem-solvers? Mayor Colau refers to the city’s superblocks as a global reference point: “When we first started implementing this policy in Barcelona, the effects were felt in many places in the world, and an enormous number of cities have shown interest in the superblocks model.” Colau believes the 21st century should be the century “in which cities play a starring role and address global challenges. They should not, however, do so in competition with one another but, rather, in cooperation. Cooperation is essential if we are to solve great global problems.”