Smart cities in Catalonia

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Government of Catalonia

Prepared by
ACCIÓ's Strategy and Competitive Intelligence Unit

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Smart cities in Catalonia

Smart cities

The smart city concept

Cities play a key socioeconomic and political role in the transformation of territories and the shift towards smart and sustainable global development in accordance with the Sustainable Development Goals set by the 2030 Agenda.

Smart cities seek to improve the quality of life of their residents by means of sustainable, inclusive, transparent and participatory initiatives that lead to efficient urban management through technology, innovation and knowledge creation.

Companies in the field

In this context, the field comprises companies that offer smart solutions for managing the various facets of cities.
Unlike in other fields and sectors, the solutions offered must be flexible enough to adapt to the local demands of towns and cities in different world regions and with different sizes and characteristics.

Source: Anteverti

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Digitalization of economies

The smart city movement is the product of the growing digitalization of economies as the world moves towards the fourth industrial revolution. In 2021, 57.3% of the world's 7.8 billion inhabitants were Internet users. In 2009, just 28.9% of the world's population was online, while only 7.6% used the Internet in 2000.

At the same time, urbanization has placed greater emphasis on public services, traffic and the environment. By 2030, 60% of the world's population will live in cities. This will require more innovative solutions to ensure that urban life is not compromised.

Most smart cities are located in advanced economies, such as the United States and South Korea, but they are becoming increasingly common in emerging market powers such as China, India and Malaysia. Increasing revenue, robust economic growth and a growing population with digital skills are driving the development of smart cities in emerging markets.

Source: Euromonitor

Smart cities: the convergence of two major trends

Urbanization

IT connectivity

Movement of people from rural to urban areas

- In 2008, the world's urban population exceeded its rural population for the first time, and it is estimated that 65% of the world's population will live in cities by 2030.

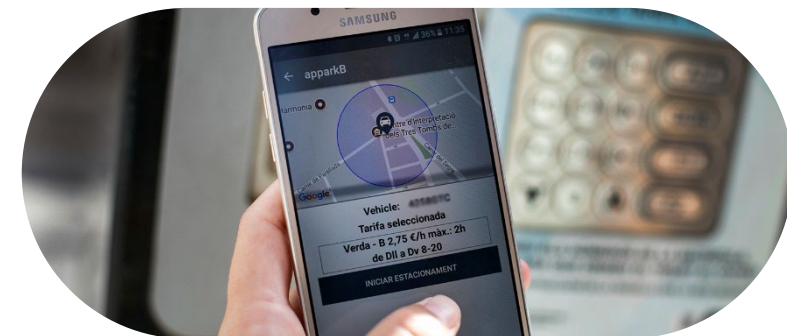### Continuous development of IT infrastructure

- As technology developed and income rose, access to the Internet and digital devices opened up opportunities in e-commerce, mobile connectivity and social media for consumers and businesses.

Sustainability → Improvements in quality of life

Source: Euromonitor

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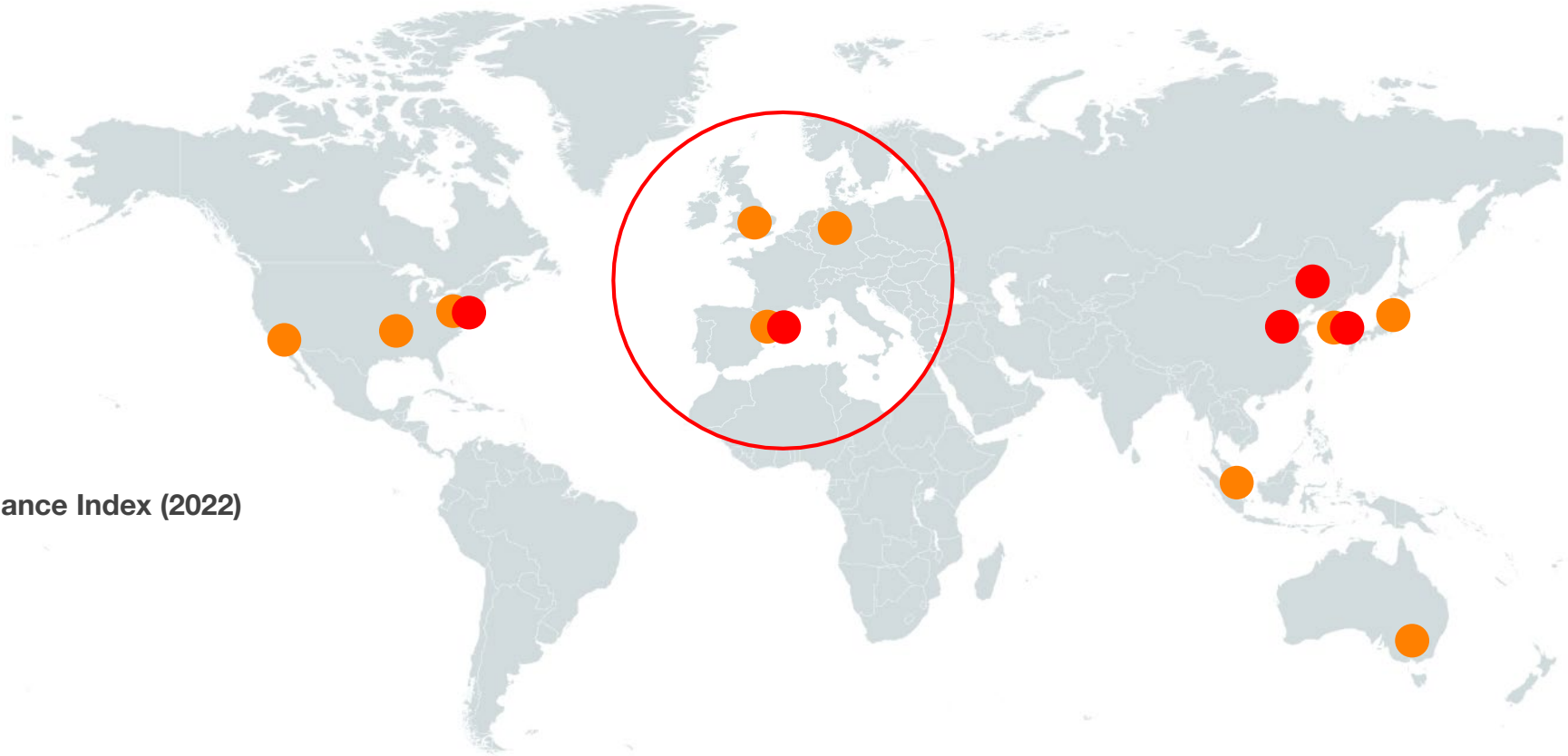
World smart city rankings

In 2022, Barcelona is the world's 3rd and Europe's 1st smart city. Juniper Research 2022

🟠 **Global Smart City Performance Index (2017)**
Singapore
London
New York
San Francisco
Chicago
Seoul
Berlin
Tokyo
Barcelona
Melbourne

🔴 **Global Smart City Performance Index (2022)**
Shanghai
Seoul
Barcelona
Beijing
New York

Source: Juniper Research

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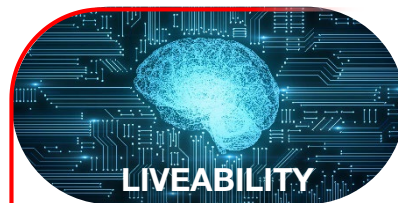Government of Catalonia

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Benefits of living in a smart city

INCLUSION

Inclusion in smart cities: extending the benefits to all residents

Smart governance
Digital inclusion
Smart security
Connected citizens
Smart education
Smart health
Smart tourism and leisure
Cybersecurity

LIVEABILITY

Liveability in smart cities: the smart home

Smart management of:
Water
Energy
Lighting
Cooling
Smart entertainment
Security
Home automation
Smart appliances

SUSTAINABILITY

Sustainability in smart cities: ensuring long-term development

Waste management
Renewable energy
Electric vehicles
Smart mobility
Zero carbon housing
Forest conservation
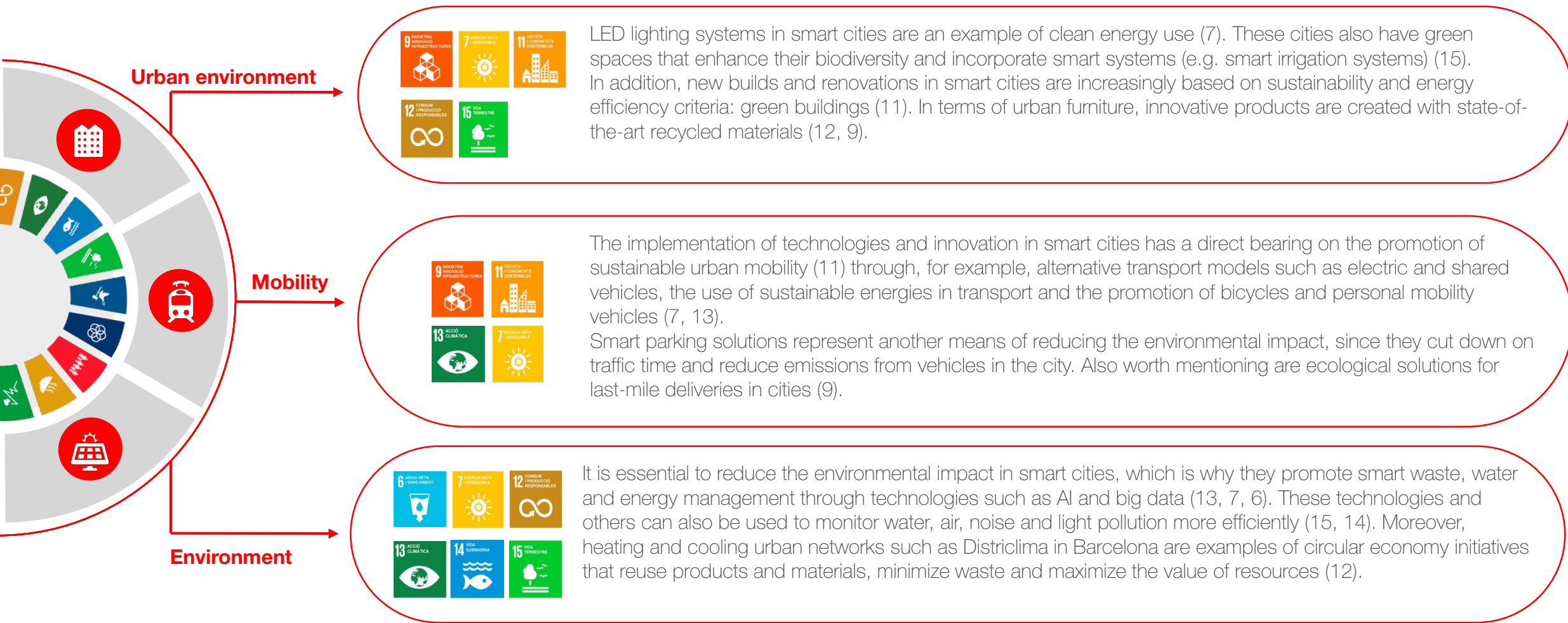Energy efficiency
Air quality monitoring

ECONOMY

The economy in smart cities: knowledge-based innovation

Knowledge economy
E-commerce
Smart retail and logistics
Smart manufacturing
Smart buildings
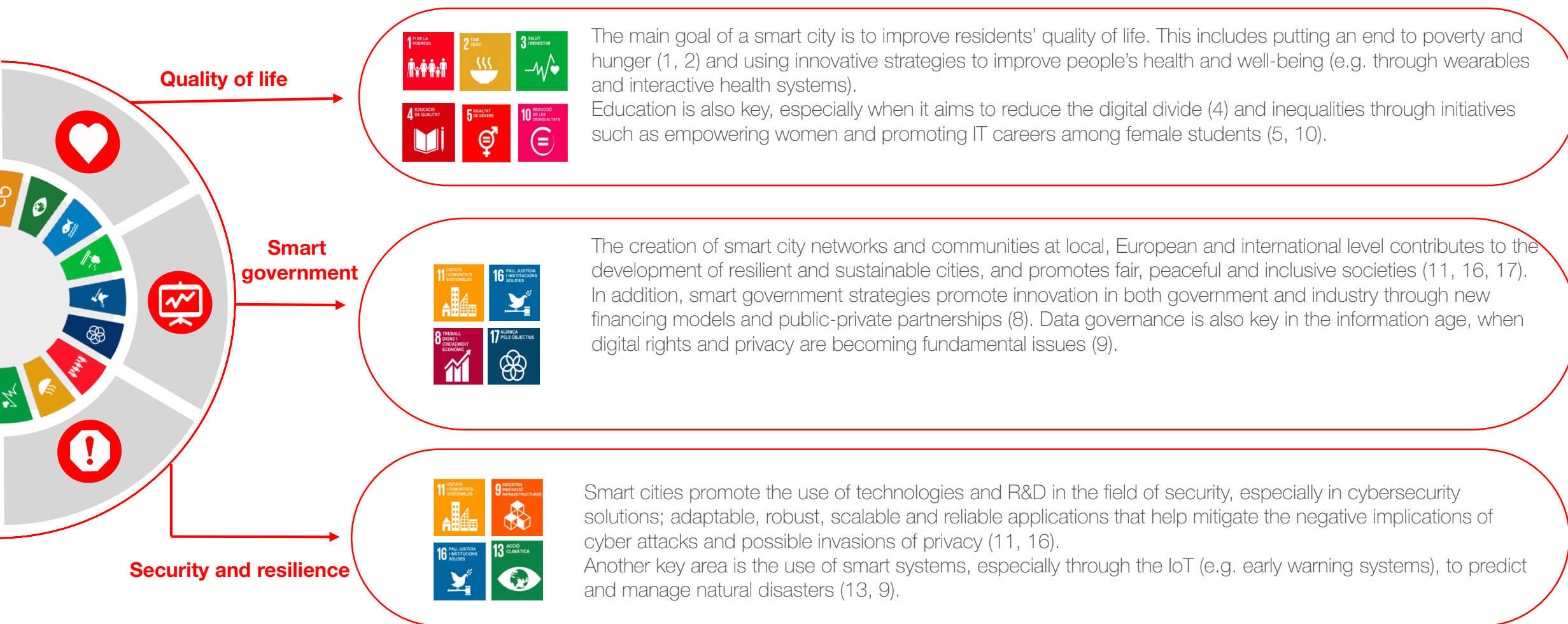Smart finance
Highly skilled workforce
R&D

Source: Euromonitor, Juniper Research 2022

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The Sustainable Development Goals in smart cities (I)

Urban environment

LED lighting systems in smart cities are an example of clean energy use (7). These cities also have green spaces that enhance their biodiversity and incorporate smart systems (e.g. smart irrigation systems) (15). In addition, new builds and renovations in smart cities are increasingly based on sustainability and energy efficiency criteria: green buildings (11). In terms of urban furniture, innovative products are created with state-of-the-art recycled materials (12, 9).

Mobility

The implementation of technologies and innovation in smart cities has a direct bearing on the promotion of sustainable urban mobility (11) through, for example, alternative transport models such as electric and shared vehicles, the use of sustainable energies in transport and the promotion of bicycles and personal mobility vehicles (7, 13).
Smart parking solutions represent another means of reducing the environmental impact, since they cut down on traffic time and reduce emissions from vehicles in the city. Also worth mentioning are ecological solutions for last-mile deliveries in cities (9).

Environment

It is essential to reduce the environmental impact in smart cities, which is why they promote smart waste, water and energy management through technologies such as AI and big data (13, 7, 6). These technologies and others can also be used to monitor water, air, noise and light pollution more efficiently (15, 14). Moreover, heating and cooling urban networks such as Districlima in Barcelona are examples of circular economy initiatives that reuse products and materials, minimize waste and maximize the value of resources (12).

Source: Anteverti, based on data from the United Nations and United Nations for Smart Sustainable Cities

The Sustainable Development Goals in smart cities (II)

Quality of life

The main goal of a smart city is to improve residents' quality of life. This includes putting an end to poverty and hunger (1, 2) and using innovative strategies to improve people's health and well-being (e.g. through wearables and interactive health systems).
Education is also key, especially when it aims to reduce the digital divide (4) and inequalities through initiatives such as empowering women and promoting IT careers among female students (5, 10).

Smart government

The creation of smart city networks and communities at local, European and international level contributes to the development of resilient and sustainable cities, and promotes fair, peaceful and inclusive societies (11, 16, 17). In addition, smart government strategies promote innovation in both government and industry through new financing models and public-private partnerships (8). Data governance is also key in the information age, when digital rights and privacy are becoming fundamental issues (9).

Security and resilience

Smart cities promote the use of technologies and R&D in the field of security, especially in cybersecurity solutions; adaptable, robust, scalable and reliable applications that help mitigate the negative implications of cyber attacks and possible invasions of privacy (11, 16).
Another key area is the use of smart systems, especially through the IoT (e.g. early warning systems), to predict and manage natural disasters (13, 9).

Source: Anteverti, based on data from the United Nations and United Nations for Smart Sustainable Cities

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International fairs in the field of smart cities

Source: ACCIÓ

Smart cities in Catalonia

Key figures in the field of smart cities in Catalonia (I)

471 companies

- **88.5%** are SMEs (fewer than 250 employees).
- **64.9%** were created more than 10 years ago.
- **26.3%** are startups.
- Compared to the previous edition in 2018, the number of companies has increased **by 7.3%.**
- **13%** of companies are foreign subsidiaries.
- **56.7%** are exporters and **28.5%** are regular exporters.

€10.5 B turnover in the field of smart cities

- This represents **4.3%** of total Catalan GDP.
- Compared to 2018, turnover increased by **7.5%.**

46,077 employees in the field of smart cities

- Compared to 2018, the number of employees increased by **2.3%.**

Source: ACCIÓ based on data from Orbis 2021 or, failing this, the latest available data. Companies for which no data were available were estimated to have a total turnover of €100,000 and three employees. The percentage associated with smart cities was applied to each company on an individual basis.

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Key figures in the field of smart cities in Catalonia (II)

Companies by county

More than 50 companies
11-50 companies
6-10 companies
1-5 companies
No companies in the field
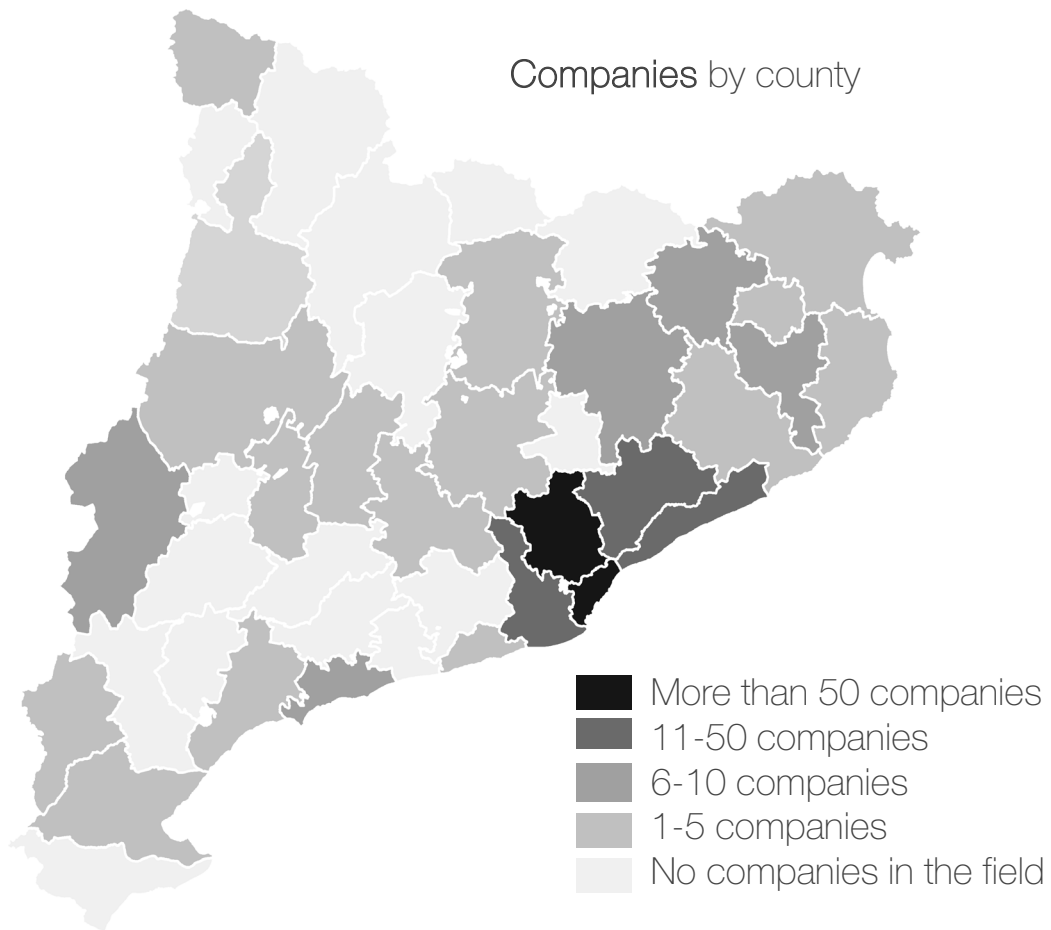
Barcelona is the city with the most companies in the field, with 76.2%.

Barcelona is followed by Girona, Tarragona and Lleida, with lower percentages.

Source: ACCIÓ

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Value chain in the field of smart cities (I)

Smart government	Mobility	Urban environment	Security and resilience	Environment	Quality of life
• E-government • Transparency and communication • Open data and data governance • Citizen participation and collaboration • Innovative management strategies and models • Ethics and digital rights	• Public transport • Electric bikes and personal mobility vehicles • Self-driving and connected vehicles • Electric and alternative fuel vehicles • Logistics • Last mile • Traffic management • Parking	• Urban service infrastructure • Urban furniture • Maintenance and paving of public roads • Green spaces • Smart and sustainable buildings • Construction and materials • Lighting • Collaborative spaces	• Warning systems • Security and surveillance services • Cybersecurity • Privacy	• Water • Energy • Heating and cooling network • Waste management • Gas • Environmental quality (water, air, noise and light) • Circular economy	• Health • Social well-being • Culture and leisure • Social inclusion and accessibility • Ageing • Housing • Sustainable tourism • Trade

Value chain in the field of smart cities (II)

Subsector of the company	Number of companies	% of total companies	
Urban environment	106	22.5%	
Mobility	92	19.5%	
Environment	90	19.1%	
Quality of life	74	15.7%	
Smart government	34	7.2%	
Security and resilience	25	5.3%	
Cross-cutting	50	10.6%	
Total	**471**	**100%**	

Note: All companies analysed may operate in one or more subsectors, but one main subsector for each company was identified.

Source: ACCIÓ based on data from Orbis.

Role of the company in the field of smart cities (I)

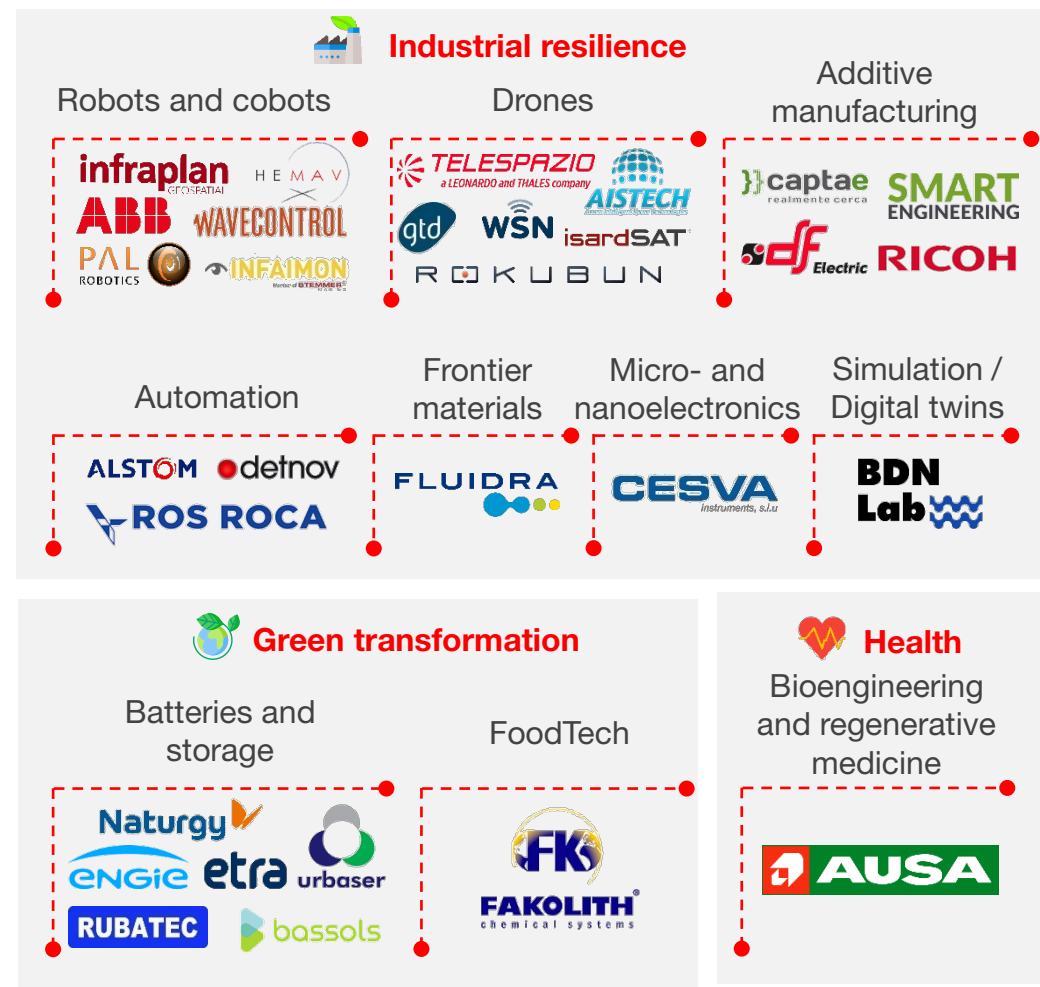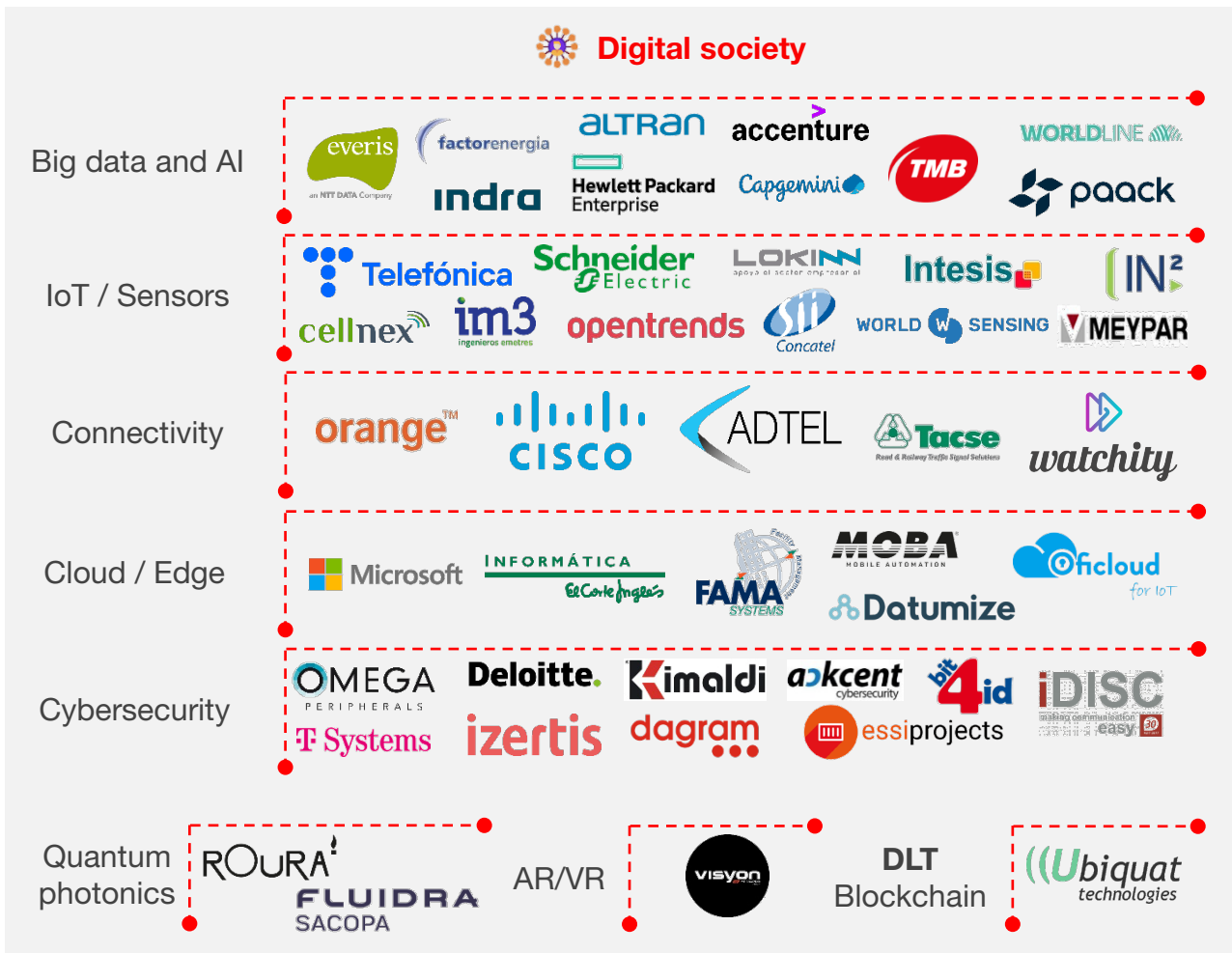| Role of the company	Description of companies
• Design and planning	Design of projects related to city planning and the successful integration of infrastructure into urban systems.
• Service provision	Provision of services to citizens directly or indirectly as public administration providers in areas such as energy, water, waste management, education and health.
• Product manufacturing	Development and creation of innovative, cutting-edge, highly specialized products for cities.
• Software development	Development and creation of software and technological platforms and apps for urban digital development.
• Hardware and software development	Integration of hardware and software. Numerous companies develop activities and products such as IoT, robotics and drones.
• Implementation, maintenance and operation	Implementation, maintenance and operation of machinery, processes and information systems for the development of different sectors of the city.
• IT integration	Integration of information technologies in the different areas of the city.
• Infrastructure deployment and management	Implementation and management of urban infrastructure.
• Construction	Construction of buildings, public spaces, squares, education centres, urban furniture and facilities, etc.
• Data management	Generation, collection and management of information generated by cities and value creation.
• Consultancies	Independent advice on smart cities based on knowledge and experience.
• Research (R&D)	Research and generation of technological and innovative knowledge on different areas of urban management.
• Training, communication and events	Training and communication to improve the management of cities and the dissemination of knowledge about smart cities.

Source: ACCIO based on data from Orbis

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Role of the company in the field of smart cities (II)

Role of the company	Name of companies	% of total companies	
Product manufacturing	109	23.1%	
Software development	106	22.5%	
Service provision	69	14.6%	
Consultancies	51	10.8%	
Hardware and software development	36	7.6%	
Implementation, maintenance and operation	21	4.5%	
Data management	18	3.8%	
IT integration	17	3.6%	
Construction	12	2.5%	
Infrastructure deployment and management	11	2.3%	
Design and planning	10	2.1%	
Training, communication and events	7	1.5%	
Research (R&D)	4	0.8%	
Total	**471**	**100%**	

Source: ACCIÓ based on data from Orbis.

Smart city companies as technology-intensive companies

Digital society

Big data and AI: everis (an NTT DATA Company), factorenergia, ALTRAN, accenture, WORLDLINE, Hewlett Packard Enterprise, Capgemini, TMB, indra, paack

IoT / Sensors: Telefónica, Schneider Electric, LOKIMM, Intesis, IN², cellnex, im3 ingenieros emetres, opentrends, Concatel, WORLD SENSING, MEYPAR

Connectivity: orange, CISCO, ADTEL, Tacse, watchity

Cloud / Edge: Microsoft, INFORMÁTICA El Corte Inglés, FAMA SYSTEMS, MOBA MOBILE AUTOMATION, ficloud for IoT, Datumize

Cybersecurity: OMEGA PERIPHERALS, Deloitte, Kimaldi, axkcent cybersecurity, bit4id, iDISC, T Systems, izertis, dagram, essiprojects

Quantum photonics: ROURA, FLUIDRA SACOPA

AR/VR: visyon

DLT Blockchain: Ubiquat technologies

Industrial resilience

Robots and cobots: infraplan GEOSPATIAL, HEMAV, ABB, WAVECONTROL, PAL ROBOTICS, INFAIMON

Drones: TELESPAZIO a LEONARDO and THALES company, AISTECH, gtd, WSN, isardSAT, ROKUBUN

Additive manufacturing: captae realmente cerca, SMART ENGINEERING, df Electric, RICOH

Automation: ALSTOM, detnov, ROS ROCA

Frontier materials: FLUIDRA

Micro- and nanoelectronics: CESVA instruments, s.l.u

Simulation / Digital twins: BDN Lab

Green transformation

Batteries and storage: Naturgy, ENGIE, etra, urbaser, RUBATEC, bassols

FoodTech: FK FAKOLITH chemical systems

Health

Bioengineering and regenerative medicine: AUSA

Note: The companies selected are a sample of each category.

Source: ACCIÓ based on data from the Catalonia Trade Portal and ACCIÓ's 2022 Technological Trends Analysis.

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Catalan ecosystem supporting the field of smart cities

Source: ACCIÓ

Smart City Expo World Congress in Barcelona

The Smart City Expo World Congress (SCEWC) offers a single meeting point for the entire smart city ecosystem. Since the first edition in 2011, it has transformed into a global event to support the development of cities. The Smart City Expo returned to face-to-face events in the aftermath of the pandemic and once again brought together the world's leading urban development stakeholders to share knowledge, highlight the most innovative solutions in the field and reflect on the major challenges facing cities today.

Key figures on the 2022 edition.

140+ COUNTRIES

20,000+ VISITORS

20,000+ ONLINE VISITORS

1,000+ EXHIBITORS

400+ SPEAKERS

700+ CITIES

SMARTCITY EXPO WORLD CONGRESS

Energy and the environment · Security and resilience

Mobility · Enabling technologies

Governance · Infrastructure and buildings

Economy

Life and inclusion
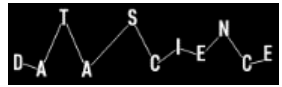
The Smart City Expo World Congress "is such a gathering of cities, governments and corporate partners that, for us, having a large presence establishes Mastercard as an orchestrator in the smart city industry. It's a chance to engage with cities and expose our solutions."

Maddie Callis – Director, City Possible. Mastercard

Source: Fira de Barcelona

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Smart city technology made in Catalonia

Technology centres in Catalonia with applications in smart cities, TECNIO centres

Smart cities scope of application

- Smart government
- Digital transformation
- Mobility
- Environment
- Security and resilience
- Smart tourism

Note*: DAMA UPC is no longer a TECNIO centre, but continues to carry out projects to support smart cities.
Source: ACCIÓ based on data from TECNIO

Barcelona is a benchmark for global smart cities

The Catalan government promotes initiatives to continue positioning **the city of Barcelona as a true hub for urban innovation, research and modernization** through the creation of self-sufficient and sustainable management solutions to improve public policies, services and goods with a social impact.

Barcelona City Council carries out pilot AI projects in different fields, such as **monitoring beach occupancy levels**, a project that was implemented in the summer of 2020 during the COVID-19 pandemic. Beach occupancy data were updated in real time on a website that citizens could check before going to the beach.

Barcelona Energia, partly owned by Barcelona City Council and Barcelona Metropolitan Area (AMB), is Spain's largest public electricity supplier and has distributed 100% renewable energy to 14 municipalities since 2019.

It supplies 100 GWh (equivalent to the consumption of almost 30,000 households) and prevents almost 25,000 tonnes of CO_2 emissions.

Barcelona optimizes public lighting management through a smart telemanagement system (2022).

Teleastro.net improves energy efficiency and reduces the need for companies involved in lighting maintenance to travel. Thus, it helps protect the environment and makes the city more sustainable, allows data collected to be integrated the city's IT infrastructure and improves the safety, efficiency and quality of the lighting service

Source: Barcelona City Council

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Engineering companies specializing in smart cities

Companies that focus on the creation of cities and ensuring that they operate at maximum efficiency. Their activities include the works and installations required to provide urban planning materials and services based on the use of IT technologies to allow digital interaction with citizens for the construction or reconstruction of cities.

Engineering production stages

Capgemini engineering · nadico · indra · ayesa · Weidmüller · IDOM

auding Intraesa · K-LAGAN · IDP · RLE INTERNATIONAL · EACOM · ENGINYERIA REVENTOS Anys Projectant Per Construir · INVALL

Grupo TYPSA · SIEMENS · EUROGEOTECNICA · MasterPlan · PlanaHurtósenginyers

Geprom · eptisa · ARC BCN · BAC · im3 · gpo group · tec4 · einesa

ABGAM Grupo Segula Technologies · KREUM · ABM · PROJECTS Facilities & Management · ECR environnement · TRACTEBEL

Alfa AH Tecnologies · CINESI · intra · ZICLA · e3 solinteg · CTP

Software + hardware

CADTECH CT SOLUTIONS · Smarting ENGINEERING

DASSAULT SYSTEMES · K-LAGAN

aimsun · FAMA SYSTEMS

Certification

Applus⁺

TÜVRheinland®

Services

etecnic · CINESI

intra

Universities and training organizations

UAB · UPC

Note: Sample of companies by turnover.

Source: ACCIÓ based on data from Catalan government's Universities Channel and ACCIÓ's report The Field of Engineering in Catalonia.

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The Catalan university system and its commitment to knowledge on smart cities

Research groups

Universitat Pompeu Fabra

Smart Government UPF is a Universitat Pompeu Fabra project that uses an innovative approach to provide public managers and students in the field of public management with relevant resources.

Universitat de Barcelona

The **Smart Cities UB Chair** is a research chair at the Universitat de Barcelona that aims to increase knowledge of the specific problems of cities and to design urban policy initiatives that help promote their competitiveness and social cohesion.

ESADE

ESADE's Centre for Innovation in Cities is a research group specializing in city management. It forms part of the ESADE Institute for Innovation and Knowledge Management.

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uni versi tats

12 universities

687 master's degrees

19,600 university lecturers

591 undergraduate degrees

208,500 university students

14,914 researchers

More than **50** design schools

Degrees

Universitat Autònoma de Barcelona

The UAB was the first Catalan university to offer a degree in smart cities.
The three-year degree is called Management of Smart and Sustainable Cities.

Master's degrees

Universitat Oberta de Catalunya

The UOC offers a master's degree in City and Urban Planning, which includes an exclusive module on smart cities.

Universitat de Barcelona

The UB has developed its own master's degree called Smart City Manager, carried out in collaboration with the Zigurat Global Institute of Technology.

Universitat de Girona

The UdG was the first European university to offer a master's degree exclusively in smart cities.

Source: ACCIÓ

Smart cities in Catalonia

Opportunities and trends in the field of smart cities

Business opportunities in the field of smart cities

Investment opportunities

- Deployment of the infrastructure network required to create smart cities.
- Maintenance of the deployed infrastructure.
- Opportunities in areas such as:
  - Energy
  - Healthcare
  - Construction of infrastructure
  - Governance

Cost reduction

- The deployment of technology, digital networks and telecommunications will allow companies to save costs in areas such as transport and mobility, property, energy, water and communication.
- Accessibility to services such as financing, healthcare and training for workers will help companies in terms of profitability and allow them to retain talent.

Increased competitiveness

- The smart ecosystem offers a favourable environment for companies through features such as: favourable taxation, reduced administrative burden, access to financing, flexible labour market with a skilled workforce and regulations to support economic activity.

- These aspects place a strong emphasis on innovation and R&D as the main drivers of cities' competitiveness.

Clusters: new companies and new business models

- Innovation-focused smart cities will give rise to clusters that will develop business incubators for R&D and companies. These companies will benefit from state-of-the-art infrastructure, partnerships with universities and research centres, and risk capital financing for startups.

- The companies will also be able to exploit the synergies generated in this ecosystem.

Source: Euromonitor

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International business opportunities in the field of smart cities by continent

The Global Map of International Business Opportunities contains a total of **35 opportunities** in the field of smart cities. Most noteworthy are the opportunities related to IT and digitalization of industry (7 opportunities), Mobility services (6 opportunities), Energy (5 opportunities) and Automotive (4 opportunities).

Asia			The Americas			Europe		Africa	Oceania
Japan	China		USA	Brazil		Germany	Belgium		
India	Singapore	Hong Kong (China)	Panama	Colombia	Chile	Netherlands	Denmark	Ghana	
Taiwan	Kazakhstan	Bangladesh	Mexico	Ecuador	Canada	Norway	Finland	Senegal	Australia

Source: ACCIÓ, based on the 2022 Global Map of International Business Opportunities.

Influential technologies in the future of smart cities

5G Internet. 5G offers much faster Internet download and upload speeds, up to 10-100 times faster than 4G. Investments in 5G will drive the development of smart mobility, especially self-driving vehicles, and smart processing and manufacturing. South Korea, China, the United States and the United Kingdom are among the main markets likely to see 5G deployments.

Blockchain. Blockchain solutions can be applied in the context of smart cities. One of the main advantages is their capacity to encrypt sensitive data, thereby improving security. Dubai has promised to become the world's first blockchain city. It hopes to use the decentralized network to support three key areas: government efficiency, industry creation and international leadership.

AI, ML and Analytics. Data are key for smart cities and companies will need to leverage data through the necessary data analysis tools. The use of artificial intelligence (AI) and machine learning (ML) in the context of data analysis will provide greater speed and efficiency when working with large datasets on cities and offer the predictive analytics required.

Source: Euromonitor

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Success stories

Success stories (I)

eCooltra is Europe's leading scooter sharing service. It has a fleet of more than 5,000 electric motorcycles and operates in six cities: Barcelona, Madrid, Valencia, Rome, Milan and Lisbon.
Through an app, users can find and book the nearest motorcycle to get around the city. The cost of the rental is billed per minute and includes insurance, battery, helmets and maintenance.

Cellnex is Europe's leading independent operator of wireless telecommunications infrastructure. With respect to smart cities, it focuses on the field of IT infrastructure, innovation and IoT.

The Smart Brain service guarantees access to urban infrastructure by standardizing data from different sources.

Urbiotica is a pioneering company in IoT that designs state-of-the-art wireless sensor systems. Its smart parking solutions are designed to improve the experiences of car park managers and users.
The solution guides users to spaces easily and quickly. It helps also make management much more effective by increasing space productivity, and also ensures better control over car park use and payments.

DEFCON8 specializes in water consumption monitoring and efficiency and coordinates and leads a unique platform that brings together around 10 energy-saving solutions. This consortium will present a pilot project to apply its platform to buildings in Germany, Slovenia, Portugal, Turkey, Israel and Catalonia.

DEFCON8 leads an international consortium (SEBR – Smart Energy Building Renovation) that won an ACCIÓ-supported, €537,000 contract to develop a pilot project aimed at converting six buildings around Europe into energy-sustainable buildings.

Seat, DGT, Barcelona City Council and ETRA have developed cellular technology to connect cars with traffic lights and the traffic control centre (DGT 3.0).

The Urban Mobility Lab (2022) is a public-private initiative that will facilitate the implementation of pilot tests and transformative projects to address current urban mobility challenges. The aim is to promote innovation in smart and sustainable mobility, in line with the 2030 Agenda SDGs.

Source: ACCIÓ
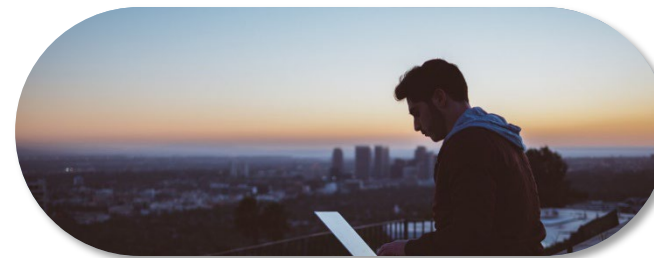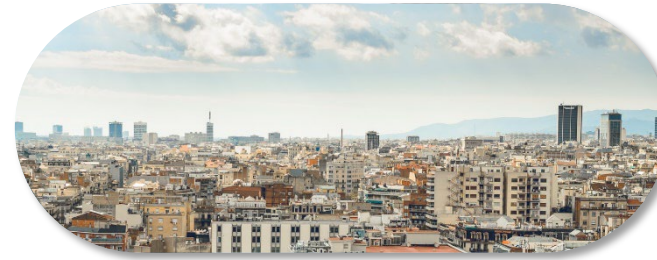
Success stories (II)

The Catalan company AEInnova (Terrassa, Vallès Occidental) has entered the Japanese market with the installation of autonomous wireless sensors for the maintenance of industrial machinery in a chemical plant.

The company has reached an agreement with the CBC Group conglomerate to supply it with devices, which are battery-free and operate autonomously by harnessing the waste heat of industrial environments and converting it into clean, sustainable electricity. These sensors monitor the vibrations of the machinery to carry out predictive maintenance by means of alerts when a failure is about to occur. This helps avoid the risks and costs involved in having to stop the production process.

AEInnova
Alternative
Energy Innovations

Source: ACCIÓ

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Thank you

Passeig de Gràcia, 129
08008 Barcelona

accio.gencat.cat
catalonia.com

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