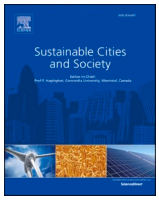
Sustainable Cities and Society 81 (2022) 103828

Contents lists available at ScienceDirect

Sustainable Cities and Society

journal homepage: www.elsevier.com/locate/scs



Smart cities' development in Spain: A comparison of technical and social indicators with reference to European cities

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ARTICLE INFO

Keywords:
Smart city
Internet of things (IoT)
Smart mobility
Open data
Information and Communications Technology (ICT)

ABSTRACT

The evolution of the Spanish cities towards their digital transformation, integration of the Internet of Things (IoT), and improvement of social cohesion have been promoted by the government. However, this evolution has not yet been evaluated, and this assessment is considerably relevant as more than 200 M€ has been spent from the European Regional Development Fund (ERDF) through five calls divided into two national plans (2014–2020). In this evaluation, the projects of 61 beneficiary local entities have been analysed. The lines of action executed have been identified and compared, using standardised indicators, with the actions conducted in the European metropolis that are smart city references. The actions planned in the last call (Smart Territories National Plan) closely resemble the philosophy of the latest generation paradigm of smart cities (holistic approach and specialisation in topics such as tourism or intelligent buildings) from the initial point where the areas of technology, software, and governance were focused. This work offers a precise picture of the priorities and lines of the progress of smart cities at each period of the last decade and helps technicians and investigators evaluate executed projects and design new lines of development.

1. Introduction

In 1950, the percentage of the population that lived in cities was 30% worldwide and 53% in Europe. Nowadays that percentage has increased to 55.3% (worldwide), 74.5% (Europe), and 80.3% (Spain). By 2050, these figures are expected to increase to 66% (worldwide), 83.7% (Europe), and 88% (Spain) (ECE, 2019; Khan, Aslam, Aurangzeb, Alhussein & Javaid, 2022; UN, 2015; 2018). In some countries such as China, South Korea, Mexico, Brazil, and several African countries, a drastic increase in the urban population is expected to occur over the next 20 years Fig. 1. shows the world's urban density and population situation in 2010 and reflects the countries with the largest percentages of these values (Vivas, 2014; WWF, 2012).

The urban population consumes 80% of overall energy and 75% of global natural resources and is responsible for 75% of carbon emissions (UNEP, 2013). However, cities offer numerous technological and socio-economic benefits and have become centres of research and education (Albino, Berardi & Dangelico, 2015; König & Evans, 2013). Notably, in the last 24 years, the annual number of publications on smart cities has multiplied by 600 (Duygan, Fischer, Pärli & Ingold, 2021; Mora, Bolici & Deakin, 2017).

Cities have a key role in fighting against climate change and developing new intelligent technologies. These technologies, driven by successful political strategies, are considered a crucial factor in decreasing greenhouse gas emissions and improving the energy efficiency of cities (Allam & Dhunny, 2019; da Graça Carvalho, 2012). They need to be integrated, and they should have an impact on environmental sustainability targets and citizens, improving social cohesion (Ahvenniemi, Huovila, Pinto-Seppä & Airaksinen, 2017), life quality (Shapiro, 2006), and the economy of cities (Rosenzweig, Solecki, Hammer & Mehrotra, 2011; Thite, 2011). Therefore, since the mid-1990s, the European Union (EU) has developed different programmes and policies to transform European cities into smart cities (Kylili & Fokaides, 2015). The Europe 2020 strategy (EU, 2010) advocates smart, sustainable, and inclusive growth. Further, it proposes a digital agenda for Europe to accelerate the deployment of high-speed internet and benefit from a single digital

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https://doi.org/10.1016/j.scs.2022.103828
Received 3 February 2021; Received in revised form 6 March 2022; Accepted 7 March 2022
Available online 8 March 2022

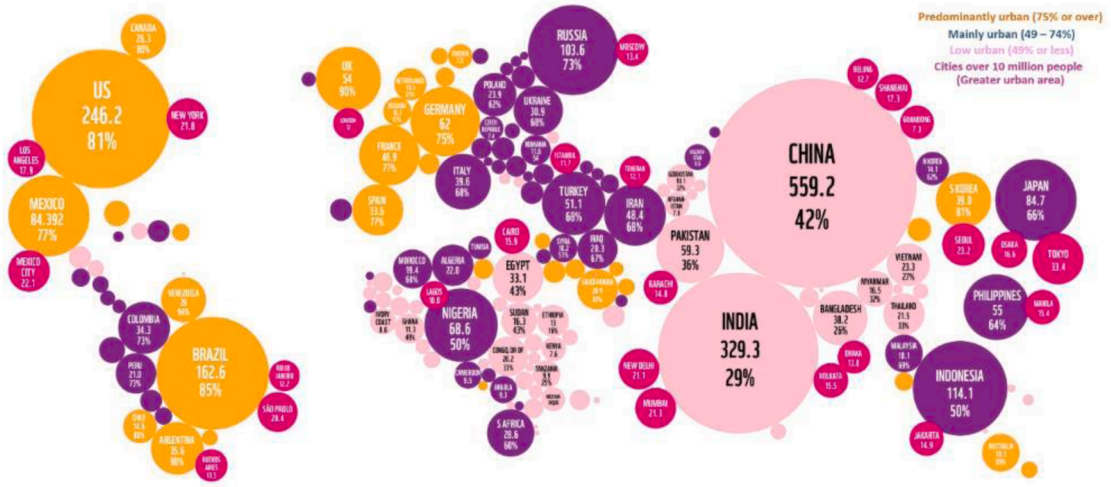

Fig. 1. Population [in millions of people] and urban density [%] in countries worldwide in 2010. Cities with more than 10 million inhabitants are displayed (WWF, 2012).

market (Morganti & Donders, 2014; Shin & Shin, 2012). The first financial commitment to developing smart cities began in the EU's 7th Framework Program (FP7) 2007–2013 and intended to contribute to sustainability, improve service efficiency, and reduce the carbon footprint in cities (Villarejo-Galende, 2015).

To achieve the objective of the Europe 2020 Strategy and enable the industrial sector represent 20% of the Gross Domestic Product (GDP) in 2020, in Spain, ten lines of action and 97 specific measures have been proposed by the document *Digital Agenda for Spain* (Agenda Digital para España, ADpE). The ADpE was approved on 15 February 2013—it was the Government's strategy to develop the digital economy and society during 2013–2015 (Del Chiappa & Baggio, 2015; Ministerio de Industria, Energía y Turismo, 2013).

The Spanish Network of Smart Cities (Red Española de Ciudades Inteligentes, RECI) was created in 2012 and included 81 cities. In 2014 and 2018, the Ministry of Industry, Energy and Tourism launched the Smart Cities National Plan and the Smart Territories National Plan, respectively, which were included in the ADpE. The first National Plan was subdivided into three calls for projects: the first (Red.es, 2014, g) and second (Red.es, 2015b) for smart cities and the third (Red.es, 2015d) for smart islands. Additionally, within the Smart Territories National Plan, the Call of Smart Tourist Destinations (Red.es, 2017j) and the Internal City Objects (ICO) announcement for projects have been published (Red.es, 2019n).

This study aims to analyse the development of smart cities in Spain, funded through various calls and national plans, identifying, classifying, and comparing their main lines of action—both technical and social—in the field of smart cities with those conducted in European reference cities in this area Section 2. introduces the reader to the concept of a smart city from different perspectives. First definitions, academic literature, and international standards have been introduced and discussed. Further, Section 3 details the methodology of the article. Subsequently, Sections 4 and 5 analyse and compare the development of smart cities in Europe and Spain, respectively. Afterwards, Section 6 details the two most prominent cities as a result of the analysis presented in the previous section. Finally, Section 7 concludes the study.

2. The smart city concept

2.1. Definitions and their scopes

The smart city concept was introduced in 1990 (Al Sharif & Pokharel, 2021); since 2010, after the appearance of the initial smart city projects, the number of articles, regulations, and reports regarding the topic has increased significantly (Desdemoustier, Crutzen, Cools & Teller, 2019; Jucevicius, Patašienė & Patašius, 2014; Bibri & Krogstie, 2017). In 2016, Fernandez-Anez (2016) presented his research about the smart city terminology, analysing 32 different definitions.

Table 1
Main keywords used in 166 definitions of a smart city. Source: UNE 178,201 (UNE, 2016c).

Keywords	*Number of times that appears*	*Percentage of appearance in the definitions*
Life quality	44	37.9%
Technology	42	36.2%
People	36	31.0%
Government and administration	35	30.2%
Systems	34	29.3%
Economy	34	29.3%
Sustainability	28	24.1%
ICT	27	23.3%
Resources	27	23.3%
Health, safety, and protection	26	22.4%

A study on smart city focuses mainly on a city's technical and environmental aspects. According to previous studies (Kitchin, 2014; Lombardi et al., 2011; Su, Li & Fu, 2011), several smart city definitions emphasise the use of modern technologies in everyday urban life, resulting in innovative transport systems, infrastructures, logistics, and green and efficient energy systems. Some other studies highlight the role of human capital in developing smart cities with improved economic, social, and environmental sustainability (Angelidou, 2017; Camero & Alba, 2019; Nam & Pardo, 2011; Neirotti, De Marco, Cagliano, Mangano & Scorrano, 2014). This holistic understanding suggests that smart cities bring together technology, government, and society to enable a smart economy and smart mobility, environment, people, living, and governance (Bakıcı, Almirall & Wareham, 2013; Giffinger et al., 2007; Ruhlandt, 2018; Su et al., 2011).

The International Organization for Standardization (ISO) defines a smart city as 'A new concept and a new model, which applies the new generation of ICT to facilitate the planning, construction, management and smart services of cities' (ISO, 2014).

The EU defines the concept of smart cities as the utilisation of 'Scalable solutions that take advantage of Information and Communications Technology (ICT) to increase efficiencies, reduce costs, and enhance quality of life' (UNEP, 2013). Moreover, the Spanish normative

Fig. 2. Comparison between smart and sustainable city indicators (Ahvenniemi et al., 2017).

UNE 178,201 (UNE, 2016c) analysed 166 smart city definitions and identified 50 keywords to create a definition according to the reference literature. The list of the ten most relevant keywords is presented in Table 1. This study concludes a definition of a smart city as 'a fair and equitable town centred on the citizen that continuously improves its sustainability and resilience. It takes advantage of the knowledge and resources available, especially the ICTs, to improve the quality of life, the efficiency of urban services, innovation, and competitiveness without compromising future needs in economic, social, and environmental governance aspects'. The International Telecommunications Union (ITU) has chosen two Spanish recommendations based on the UNE 178,104 (UNE, 2016b) to be included in the international standard for the interoperability of smart cities' service platforms (ITU, 2018b).

These recommendations are incorporated in ITU-T Y.4201 (High-level requirements and reference framework of the smart city platform) (ITU, 2018c) and ITU-T Y.4200 (Requirements for the interoperability of smart city platforms) (ITU, 2018a).

It is a widespread mistake to confuse a sustainable city with a smart city. A city must be sustainable to be smart, but it can be sustainable without being smart Ahvenniemi et al. (2017). have elaborated a comparative study around these concepts that are different but simultaneously complementary. Indicators for sustainability assessments in cities have been provided by many researchers in the past decade (Huovila, Bosch & Airaksinen, 2019; Shen, Jorge Ochoa, Shah & Zhang, 2011; Silva, Khan & Han, 2018; Wei, Huang, Li & Xie, 2016). Additionally, several evaluation frameworks are accepted nowadays, such as the United Nations Sustainable Development Goals (UN-SDG), which comprises 232 indicators. Other examples include the ISO 37,120 and the UNECE-ITU, which comprise 116 and 72 indicators, respectively (Dall'O', Bruni, Panza, Sarto & Khayatian, 2017; Shmelev & Shmeleva, 2019) Fig. 2. shows the main indicators used to define both concepts.

2.2. Evolution of smart cities

Three generations related to the development of smart cities have been documented: (i) a stage that includes ICTs, mobility, and energy activities; (ii) a stage with a holistic approach; a stage that incorporates technological governance and social innovation (Fernández-Añez & Fernández-Güell, 2019; Ibrahim, El-Zaart & Adams, 2018).

In Europe, the first generation is associated with the strategic implementation plan proposed by the 'European Innovation Partnership of Smart Cities and Communities' (EIP-SCC) programme, published in 2013 (MASCHIO, 2016). This programme highlighted ICT actions conducted in cities that were already developing their projects, generally led by telecommunications companies (Pérez-González & Díaz-Díaz, 2015; Telefónica, 2011). These areas and the development of specific technologies for their transformation in an urban context (sensors, IoT, Big Data, etc.) (Deakin & Waer, 2011) were also the starting point for new technology models and small and medium enterprises (Allwinkle & Cruickshank, 2011). An example of a city that has maintained this strategy model is the city of Vienna, which has fixed objectives for 2020, 2030, and 2050 in its strategic city plans Roblek (2019).

The second generation presents a holistic approach. This is proved by the 'Mapping Smart Cities in the UE' report presented by Manville et al. (2014) in 2014. This report reflected that the reality of the projects of European smart cities was more complex than that of previous versions. In this second stage, one more classification was used, following Ginfinger et al. (2007) or Castelnovo, Misuraca and Savoldelli (2016), who classified the pillars of a smart city into governance, economy, environment, mobility, people, and habitat. Some cities succeeded in this approach, and others did not (Anthopoulos, 2017; Monzon, 2015). The old plan of the Barcelona smart city would be an example of applying this holistic vision (Jensen, Cashmore & Späth, 2018; Zygiaris, 2013).

The third generation of smart cities comprises towns that had already driven the previous projects and have updated their priorities to current trends to regain leadership in urban technology projects (Batabyal & Nijkamp, 2019). The cases of Vienna (Fernandez-Anez, Fernández-Güell & Giffinger, 2018; Roblek, 2019), London (Pozdniakova, 2018; Zvolska, Lehner, Palgan, Mont & Plepys, 2019), Amsterdam (Neuroni, Haller, van Winden, Carabias-Hütter & Yildirim, 2019), Berlin (Zvolska et al., 2019), and recently Seville, Malaga, or Valencia in Spain stand out (Red.es, 2019n).

3. Methodology: research design

The major studies on smart cities have been compiled to select three references in Europe in terms of smart city strategy development and success. Thereupon, the development strategy of European smart cities is compared with that conducted in Spain, where three different phases are evaluated: the first two within the Smart Cities National Plan and the

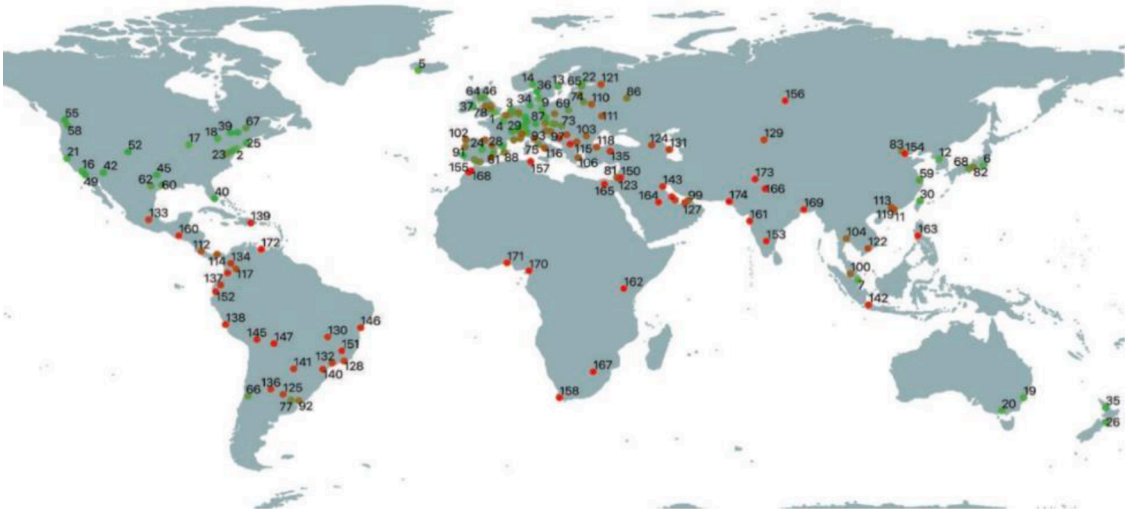

Fig. 3. Ranking of smart cities in the world according to the IESE in 2019 (Ricart, Berrone, Duch & Carrasco-Farré, 2019).

last one within the Smart Territories National Plan. The stages correspond to the periods defined in public project calls: public tender, execution, and verification of achievement of objectives (De la Quadra-Salcedo & Fernández del Castillo, 2009). The first stage corresponds to the First Smart Cities call for projects that began in June 2014 (Red.es, 2014, g). These projects have already been executed, and, currently, the study of the impact and degree of fulfilment of the objectives is being conducted. The second stage corresponds to the Second Smart Cities call for projects and the Smart Islands Call—currently, they are in an execution period (BOE, 2018, 2019a, 2019b). Finally, the third stage corresponds to the Smart Tourist Destination Call and the ICO call for projects, which are currently in the bidding period (Red.es, 2015h, 2017j, 2019n).

4. Smart cities in Europe

The European Parliament's Industry Research and Energy Committee examined cities with at least 100,000 residents and found that 240 of these (51%) had implemented or proposed smart city initiatives. Further, notably, 90% of cities with over 500,000 inhabitants have developed smart city projects. The countries with the largest number of these cities are the United Kingdom (UK), Spain, and Italy (Manville et al., 2014).

According to Manville et al. (2014), Amsterdam, Barcelona, Copenhagen, Helsinki, Manchester, and Vienna are the six most successful cities. However, Joss, Sengers, Schraven, Caprotti and Dayot (2019) claim that the list of smart cities in Europe is headed by London, followed by Barcelona, Vienna, Amsterdam, and Paris.

Finally, a Cities in Motion Index is generated every year by the IESE (led by Pascual Berrone and Joan Enric Ricart) (Ricart, Berrone, Duch & Carrasco-Farré, 2018, 2019, 2020). In 2019, Europe dominated the top-ranking positions of this index, with Amsterdam (3), Paris (4), Reykjavik (5), Copenhagen (8), Berlin (9), and Vienna (10), which accompany London (1) in the top 10 that has occupied this privileged

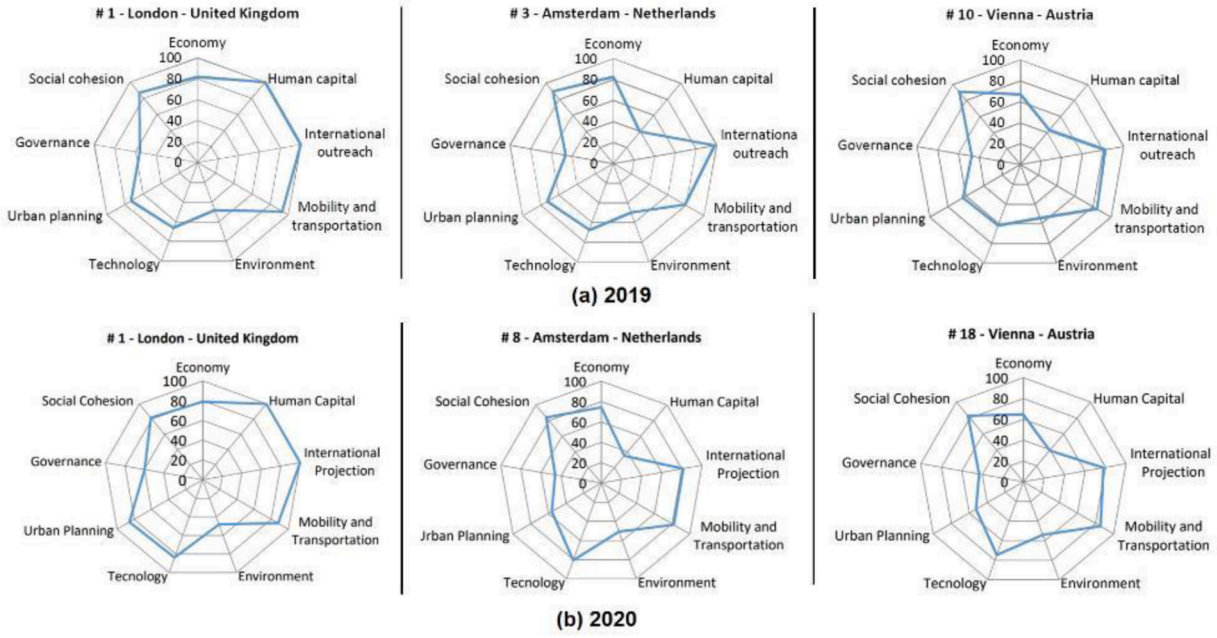

Fig. 4. Evaluation of indicators in three representative smart cities in Europe: London, Amsterdam, and Vienna (a) 2019 (b) 2020. Sources: IESE 2019 (Ricart et al., 2019) **& IESE 2020** (Ricart, Berrone, Duch & Carrasco-Farré, 2020).

position in 2020. This top group is completed with two Asian cities—Tokyo (6) and Singapore (7)—and a city from North America—New York (2). Furthermore, if we increase the scope to the top 50, the dominance of Europe is still evident as more than half of the cities (28) are European. North America with 13, Asia with 5, and Oceania with 4 complete this classification (see Fig. 3).

In this review, ten smart city axes are considered: governance, urban planning, public management, technology, the environment, international outreach, social cohesion, mobility and transport, human capital, and economy. The results obtained are broadly in line with other international surveys (Business Chief, 2019; Cohen & Cohen, 2012; Forbes, 2016; Innovotics, 2019) and specific European smart cities' rankings. This last item includes the European Green Capital Award (Akande, Cabral, Gomes & Casteleyn, 2019), the European Green City Index (Siemens, 2017), the European Green Leaf Award (EU, 2019), the European Soot-free City Ranking (Reh, Fellermann & Duprez, 2013), and the Europe Quality of Life Index Numbeo (2016).

The international leadership of London, Amsterdam, and Vienna in smart cities is evidenced by reviewing the literature reporting the smart city rankings and the prizes they have been awarded for their development strategies. We analyse these three examples of successful smart city programme development that achieve different results in nine of the previous axes established as an evaluation reference (see Fig. 4).

4.1. London

Despite the uncertainty surrounding Brexit, the capital of the UK stands as the smartest city in the world according to both the 2019 and 2020 IESE Cities in Motion Index (Ricart et al., 2019, 2020). Such consideration is due to its huge international projection, human capital, integrated and efficient transport system, technological development, and economic robustness. Its major strength is, above all, the technological innovation being integrated into the city. Further, it stands out at the mobility level with an integrated subway/underground structure, train and bus transport system, and a futuristic network connecting to its main airport, the Heathrow pods (Hopkins & Schwanen, 2018; Phenix, 2014; Potter, Valdez, Cook & Langendahl, 2015). However, there is significant deterioration in its social and environmental cohesion.

The British Standards Institution (BSI) issued the smart city standards in 2014, which was the first worldwide list of specifications to generate operational models of smart cities. As part of its smart city strategy, the UK government commissioned this standard comprising a suite of six initial complementary documents considering each of the different areas of development (Joss, Cook, & Dayot, 2017).

The British capital is the world leader in open data policy. Its smart city initiative was started with creating an extensive open database—the London Datastore—in 2010. It was fully embedded with the inception of the Smart London Board in 2013 (Board, 2013). This is considered the first open data platform that provided access to public information for its use in innovative application development (Coleman & Goldstein, 2013; Olleros & Zhegu, 2016). Today, it is used for more than 50,000 individuals, companies, researchers, and developers every month (Ben Letaifa, 2015). The strategic smart city plan included several initiatives for citizen engagement, data, and innovation enhancement. This has been complemented by several laboratories, research institutes, and start-ups—London hosts more programmers than almost any other city in the world (smartcity.Press, 2017; Wright et al., 2017; Wright, Siegel & Mustar, 2017), (Cuvero, Granados, Pilkington & Evans, 2019). These institutes and start-ups are developing free Wi-Fi and smart mobility programmes (Anthopoulos, 2017; Vitunskaite, He, Brandstetter & Janicke, 2019), intelligent road and traffic management, cycle renting systems (Silva et al., 2018), etc. Specifically, projects like the London Environment Strategy (LES) have become an efficient mechanism to mitigate the most severe effects of climate change. Hence, it can be considered one of the most ambitious smart city projects worldwide (Contreras & Platania, 2019).

The Government of London has installed more than 600 cameras in 21 km^2 and 174 access points and exits to the city and defined a programme of fines creating restricted traffic zones. Thus, a 53% decrease in traffic was achieved over 14 years in central London, together with the increase of alternative transport up to 203%. In ten years, the 1.2 billion £ of net income accumulated by collecting fines was invested in developing a bus network and improving bridges and other urban infrastructure (Advertorial, 2019).

Several actions will be conducted under the commitment to open data in the upcoming years. amongst them, the following can be found: creating value for the city and businesses; city sensorisation to handle real-time traffic or air quality information; a detailed plan to attract technical talent and support the digital formation of its population (López, 2019).

4.2. Amsterdam

Amsterdam is universally recognised as the first smart city globally because articles related to the Amsterdam Digital City have been published since 1994 (Angelidou, 2014; Dameri, 2014; Dameri & Cocchia, 2013). Its success results from an approach closely linked to strategic urban planning development principles (Mora & Bolici, 2017). Nevertheless, the city's development has overcome several stages, starting from the digital city strategy. First, the Digital City concept was born when ICTs were used to help Amsterdam citizens face political elections. Second, the city pioneered a strategy to face pollution and energy consumption in urban areas. Finally, the city presents itself as an urban living lab that allows businesses to test and demonstrate innovative products and services. Such characteristics allow creating an infrastructure for knowledge exchange and learning between companies and citizens. Thus, this strategy has resulted in particular projects focusing on sustainable energy, innovative health solutions, better urban mobility, and more resident participation (Meijer & Bolívar, 2016). Amsterdam has the continuous contribution of technicians, designers, engineers, and scientists through the Smart Citizen's Lab platform to develop kits that measure temperature, humidity, light, sound, carbon monoxide, and nitrogen dioxide emissions. Additionally, citizens were trained to interpret and upload data to the platform (Advertorial, 2019).

The Amsterdam Smart City (ASC) project integrates public administrations, research institutions, companies, and citizens into a single association whose objective is to develop the metropolitan area of Amsterdam (Communi & Facili, 2015; Wu, 2018). The ASC Platform was initiated by the Economic Council of Amsterdam, the City of Amsterdam, the gas and electricity company Liander, and the fixed and mobile telephone operator KPN. The platform has expanded with more than 70 partners involved in different projects related to energy and connectivity (ESMARTCITY, 2014; Mora, Deakin & Reid, 2019). In addition to the platform, the project included the following:

- Urban living labs and open data policy were implemented, following the British model.
- Living: As residential homes contribute to approximately one-third of the total CO2 emissions in the city, ASC addresses this area by applying intelligence and energy-saving technologies in neighbourhoods such as Geuzenveld or Ijburg (ESMARTCITY, 2014; Wu, 2018).
- ITC infrastructure: Amsterdam Free Wi-Fi project and fibre optic deployment are being conducted in neighbourhoods such as Ijburg, Osdorp, Oostelijk Haven, Indische, and Oosterpark (ESMARTCITY, 2014; Mediafeed, 2016).
- Working: Certain projects focused on sustainable real estate, companies' work processes, and awareness in smarter working modes. For instance, flexible work schedules were used to avoid wasting time in traffic jams (CONSTRUIBLE, 2008; McLaren & Agyeman, 2015; Michelet, 2012).

Table 2
Local entities benefiting from the 2014–2018 SCNP, divided into the FCSC, SCSC, and CSI funding programmes.

Smart Cities National Plan (2014–2018)	
First Convocation of Smart Cities (FCSC)	
Alcala la Real City Council	390,014.66 €
Lepe City Council	200,000.00 €
Sevilla City Council	965,626.52 €
Martos City Council	999,977.93 €
Huelva City Council	603,405.00 €
Granada City Council	599,029.14 €
Malaga Provincial Council	5785,930.81 €
Valdepeñas City Council	800,000.00 €
Toledo City Council	999,333.57 €
Villanueva de la Serena City Council	450,846.00 €
Commonwealth of Almendralejo-Badajoz	1999,838.27 €
Second Convocation of Smart Cities (SCSC)	
Alicante City Council	2942,110.59 €
Gijon City Council	7386,188.00 €
Commonwealth of A Coruña Madrid, Stgo Compostela and Zaragoza	2090,461.80 €
Santander City Council	6675,000.61 €
Las Palmas City Council	7974,360.82 €
Lugo City Council	4112,801.00 €
Valencia City Council	5998,733.46 €
Palencia City Council	1850,127.51 €
Caceres City Council	3782,805.29 €
Valladolid City Council	3614,395.90 €
Murcia City Council	7999,018.82 €
Ponferrada City Council	1570,045.55 €
Segovia City Council	2210,670.00 €
Córdoba Provincial Council	4847,608.63 €
Convocation of Smart Islands (CSI)	
Mallorca Island Council	8876,245.00 €
Fuerteventura Island Council	6556,533.00 €
El Hierro Island Council	3852,670.00 €

Table 3
Local entities benefiting from the 2018–2022 STNP, divided into the CDDT and CSB funding programmes.

Smart Territories National Plan (2018–2022)	
Convocation of Smart Tourist Destinations (CSTD)	
Níjar City Council	320,388.70 €
Huesca Provincial Council	497,058.00 €
Granada Provincial Council	2877,214.77 €
Almuñécar City Council	64,130.00 €
Plasencia City Council	619,036.00 €
Adeje City Council	5999,474.55 €
San Bartolomé Tirajana City Council	5754,136.00 €
Salou City Council	2941,500.00 €
Lloret de Mar City Council	3242,732.00 €
Conil de la Frontera City Council	1156,021.28 €
Puerto de la Cruz City Council	893,186.30 €
Ibiza Island Council	5990,601.54 €
Arona City Council	5672,939.80 €
Alicante Provincial Council	2982,045.00 €
Badajoz Provincial Council	2982,045.00 €
Benidorm City Council	4023,058.74 €
Cádiz Provincial Council	1975,206.00 €
Roquetas de Mar City Council	1357,330.00 €
Calviá City Council	4070,749.42 €
Commonwealth of Do Salnes	1489,996.42 €
Pontevedra Provincial Council	1900,000.00 €
Ourense Provincial Council	2989,022.34 €
Ourense City Council	2908,410.93 €
Valencia Provincial Council	5690,578.00 €
Bilbao City Council	5917,154.89 €
Convocation of Smart Buildings (CSB)	
Sevilla City Council	4999,974.10 €
Malaga City Council	4961,000.00 €
LHospitalet de Llobregat City Council	2488,326.92 €
Terrassa City Council	2500,000.00 €
Mostoles City Council	2117,812.66 €
Valencia City Council	5000,000.00 €
A Coruña City Council	4998,836.02 €
Vigo City Council	4999,999.98 €

- Mobility: Mobility by bicycle was prioritised, suppressing 25,000 parking spaces. Nowadays, 25% of all resident trips are made by bicycle (Álvarez, 2019).

The city of Amsterdam has a long history of awards and recognitions as a European smart city reference. This list includes the following: *Top Ten World's Smart Cities* in the Forbes index of 2009 (Forbes, 2009); *Benchmark of Excellence* and *European City Star Award* by the European Commission (EC) (2009 and 2011) (ISSUU, 2011); *World Smart Cities Awards* in 2012 and finalist in 2015 (SCEWC, 2012); recognition for one of the six most successful smart cities in Europe by the European Parliament in 2014 (Manville et al., 2014) and one of the top five cities in the world in policymaking for smart city development, urban innovation, and entrepreneurship (Gibson, Robinson & Cain, 2015).

4.3. Vienna

Evidence about the smart city of Vienna was first reported by Madreiter and Haunold (2012), who described its context and the launching process in 2011. Further, Anthopoulos (2017) ranked Vienna first amongst 100 cities according to a combination of indexes measuring local innovation, ICT, and quality of life. The initial project mainly focused on energy efficiency. Nowadays, a strategy for 2050 includes several initiatives that vary from a new district development to climate change adaptation, sustainable living, education, and research Anthopoulos (2017). The 'Smart City Wien Framework Strategy' has three aspects 'Quality of living', 'Resources', and 'Innovation'. These aspects structure specific topics and goals associated with them (Fernandez-Anez et al., 2018).

Recently, Vienna has managed to dethrone Melbourne for the first time in the Global Habitability Index, reported by the Intelligence Unit of The Economist magazine every year. Both cities have competed for seven years for the first place, and since 2018, Vienna, together with a European city, has taken the lead (BBC, 2016; El Huffington Post, 2019; Velert, 2018).

The largest number of projects of the Vienna Smart City addresses the environmental dimension. According to Fernandez-Anez et al. (2018), the governance, human capital, and social cohesion dimensions occupy the second, third, and fourth positions, respectively, in terms of the number of projects.

As in the previous cases, the city of Vienna also has numerous awards: recognition for one of the six most successful smart cities in Europe by the European Parliament (2014) (Manville et al., 2014); the World Smart Cities Award (2016); leader of the smart city Strategy in 2017 (Zelt, Ibel & Tuncer, 2017).

5. Smart cities in spain: a case study

This section describes the Smart Cities National Plan (SCNP) (Red.es, 2015h) and the Smart Territories National Plan (STNP) (Jiménez, 2019). The SCNP was launched in 2014 and included the First Convocation of Smart Cities (FCSC) (Red.es, 2014h), the Second Convocation of Smart Cities (SCSC) (Red.es, 2015c), and the Convocation of Smart Islands (CSI) (Red.es, 2015e). Moreover, the STNP was launched in 2018 and was composed by the Convocation of Smart Tourist Destinations (CSTD) (Red.es, 2019h) and the Convocation of ICO, which is also known as the Convocation of Smart Buildings (CSB) (Red.es, 2019n). In Tables 2 and 3, all the municipalities that have been beneficiaries of both national plans (61 initiatives) are represented together with the budget allocated to each project. Meanwhile, in Fig. 5, these projects are georeferenced. Notably, the area of each point represents an approach to the budget of each initiative.

The methodology used to generate the projects aimed to discretise the actions by components, where each of them is defined as a

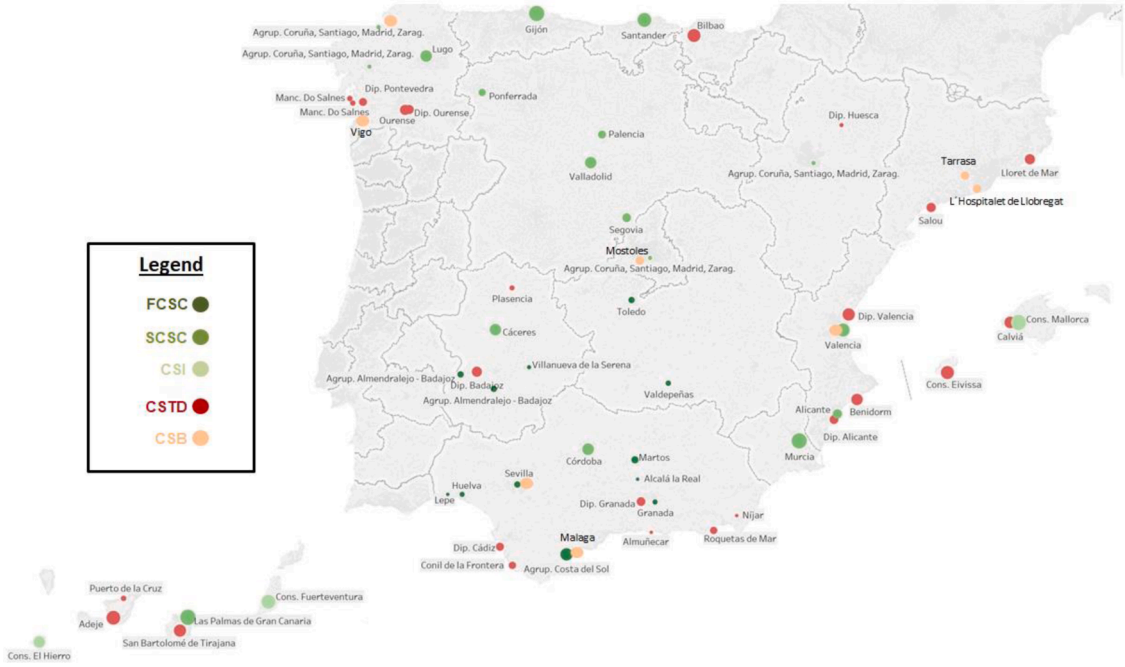

Fig. 5. Location of all the cities in Spain included in the National Plan and Smart Territories National Plan indicating their funding programmes.

Table 4
Components and areas of smart city included in the SCNP and the STNP.

Smart City Areas	Components
Social cohesion	Control centres (emergencies, control)
	Accessibility
	Smart SOS points
	Chatbots
	Opinion polls
Governance	Consultancy
	Open data portal
	Content management system
Smart city platform	Smart city platform
Urban planning	Mobility flows (operator data and others)
	Big data
	People counting system
	Video monitoring
	Fire detection systems
	Geographic information system (GIS)
International outreach	Tourist/city card and smart bracelets
	Digital contents
	Virtual and augmented reality
	Tourist planner
Software (Apps and webs)	App
	Web portal
Mobility	Electric bikes/vehicle charging station
	Smart taxi/bus
	Smart parking
	Traffic management
Technology	Network management system
	Wireless networks
	Hardware equipment (CPD, office, etc.)
	Totems/information panels
	Tourist office digitisation
	Beacons
Environment	Climate/environmental sensors
	Smart buoys
	Energy efficiency in buildings
	Smart waste management
	Smart watering
	Smart lighting
Human capital	Hackathons/conferences
	Customer relationship management (CRM)
	Citizen participation
	Innovation centres

quantifiable action representing a fraction of the project. A total of 41 components are identified in the 61 projects, and they are analysed and classified in 10 areas, as shown in Table 4. The following subsections detail each of the calls generated by both national plans, mentioning the beneficiary local entities and their lines of action or predominant components.

Other funding lines are not specific but include actions in smart cities. One of them is the Strategy for Sustainable and Integrated Urban Development (EDUSI), which manages ERDF funds with a total amount of more than 1000 M€ (EDUSI, 2019; La Vanguardia, 2016). This is why major cities like Barcelona or Madrid, with other financing sources (public and private), are not included in this study (Fernández-Áñez, Fernández-Guell, Giffinger & Polleti, 2018). Barcelona, for example, has planned to allocate 90 M€ between 2015 and 2025 with its resources to boost investment linked to economic growth, innovation and urban public services of smart cities (La Vanguardia, 2015).

5.1. *Smart cities national plan funding programmes*

5.1.1. *First convocation of smart cities*

The FCSC had a budget of 15 M€. It was focused on town halls or groupings of town halls with more than 20,000 inhabitants belonging to the autonomous communities of Andalusia, Castilla La Mancha, and Extremadura (Red.es, 2015a). The beneficiary local entities were Alcala la Real (Red.es, 2014b), Lepe (Red.es, 2014e), Sevilla (Red.es, 2014i), Martos (Red.es, 2014f, 2016c), Huelva (Red.es, 2014d), Granada (Red.es, 2014c, 2015f), Malaga (Red.es, 2014j; 2015 g), Valdepeñas (Red.es, 2014k), Toledo (Red.es, 2014l, 2017c), Villanueva de la Serena (Red.es, 2014m), and Almendralejo-Badajoz (Red.es, 2014a). The list of local beneficiary entities has been sorted by location according to the list of beneficiaries (BOE, 2015, 2016).

The projects awarded within this first call have already been completed. The evaluation of the implemented solutions is currently being conducted by Red.es—a public company of the Ministry of Economy and Digital Transformation that depends on the Secretary of State for Digitalization and Artificial Intelligence.

The actions of each project are summarised in Figs. 6 and 7, which show how the predominant components correspond to the generation of mobile applications (82%), followed by the smart city platform, web

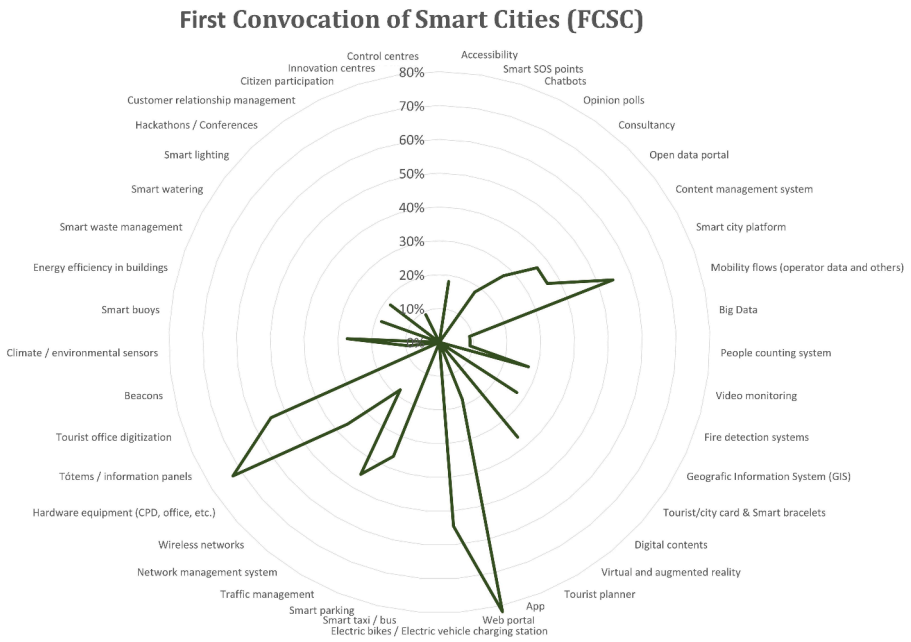

Fig. 6. Components defined in the initiatives presented in the FCSC.

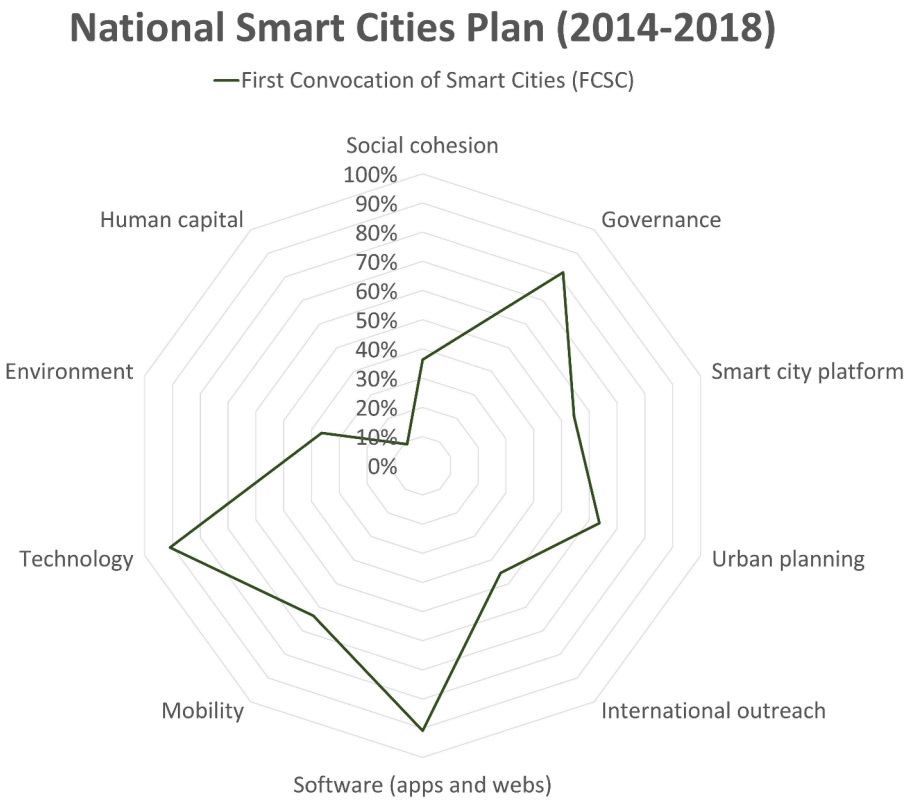

Fig. 7. List of actions presented in the FCSC summarised according to the principal areas in the smart city axes.

portal, and information panels (each of them with a presence of 55%) Fig. 8. shows examples of these components of finished projects.

According to the literature mentioned in previous sections (Shen et al., 2011; Shmelev & Shmeleva, 2019), except initiatives such as Costa del Sol (Malaga), it is verified how the actions are framed within the first stage of smart cities, focusing developments mainly in areas of technology, software solutions, and governance. This is illustrated in Fig. 6, which represents the components list summarised according to the principal areas in the smart city definition.

5.1.2. Second convocation of smart cities

The SCSC, currently in execution, was launched in July 2015 and had a total initial budget of 48 M€, which was finally extended to 63 M€ (Red.es, 2016a). A total of 108 projects were submitted to the call, worth 261 M€. After the resolution, 14 projects were granted in the localities of the City Councils of Alicante (Red.es, 2017a, 2018a), Gijon (Red.es,

Fig. 8. APPs and webs implemented in the City Councils of (a) Valdepeñas (Red.es, 2014k)**, (b) Lepe** (Red.es, 2014e)**, (c) Huelva** (Red.es, 2014d)**, and (d) Alcala la Real** (Red.es, 2014b)**.**

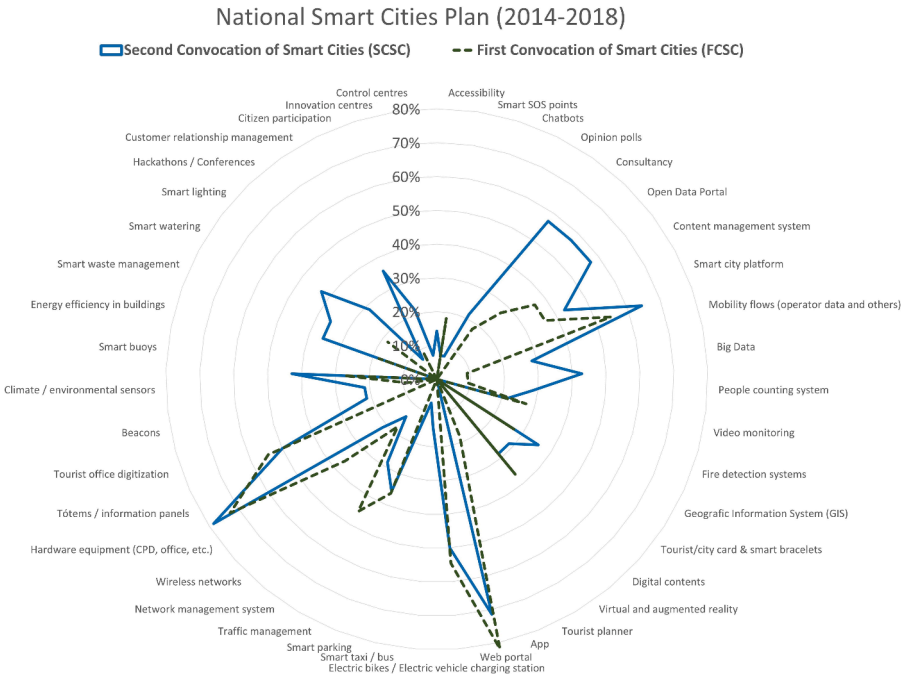

Fig. 9. Components defined in the initiatives presented in the SCSC compared with those belonging to the FCSC.

2017e), Santander (Red.es, 2017m; 2018j), Las Palmas (Red.es, 2016f, 2017b), Lugo (Red.es, 2018d), Valencia (Red.es, 2017f; 2018c), Palencia (Red.es, 2018b, 2018l), Caceres (Red.es, 2016b, 2017n), Valladolid (Red.es, 2017l, 2018i), Murcia (Red.es, 2017 g; 2018e), Ponferrada (Red.es, 2016 g, 2018h), Segovia (Red.es, 2016h, 2018k), Provincial Council of Córdoba (Red.es, 2017h, 2018f), and the Commonwealth of La Coruña, Madrid, Santiago de Compostela, and Zaragoza (Red.es, 2017i; 2018 g).

The actions proposed in each project are summarised in Fig. 9. They are driven by a larger budget allocated to each initiative (4.5 M€ on average per project compared to 1.25 M€); a slight evolution compared to the first call can be visualised. Furthermore, it has highlighted a greater commitment in lighting actions, waste management, open data or energy efficiency in buildings, and what would correspond to actions in an environment and urban planning areas according to the grouping defined in previous lines (see Fig. 10).

Although there is a slight increase in actions that improve human capital, social cohesion, or the environment, the components are mostly urban planning (GIS, mobility flows, video monitoring, etc.), technology (sensors, hardware, Wi-Fi, etc.), and software solutions. Thus, it is not considered that in this second call for projects, the set of initiatives had not evolved sufficiently to classify them within the second-generation paradigm of smart cities.

5.1.3. *Convocation of smart islands*

The CSI, also in the execution period, was launched in July 2015 and was directed to the Autonomous Communities of the Canary Islands and the Balearic Islands. The call had a budget of 30 M€ fully funded by Red.es, and the maximum budget per initiative was 10 M€ (Red.es, 2016e). The initiatives could act on different areas of the infrastructures and services of the island if all those areas were integrated into the Smart Islands strategy and attend to improving the public services of the territory using ICTs. The beneficiary islands were Mallorca (Red.es, 2016i, 2018n), Fuerteventura (Red.es, 2017d, 2019w), and El Hierro (Red.es, 2016d, 2019v).

Figs. 11 and 12 show that this call represents a significant step forward compared to the previous ones. This is because it involves a commitment to the environment, social cohesion, technology, and smart island platforms. As the call for projects was launched on the same date as the SCSC, the initiatives involved are more ambitious. The

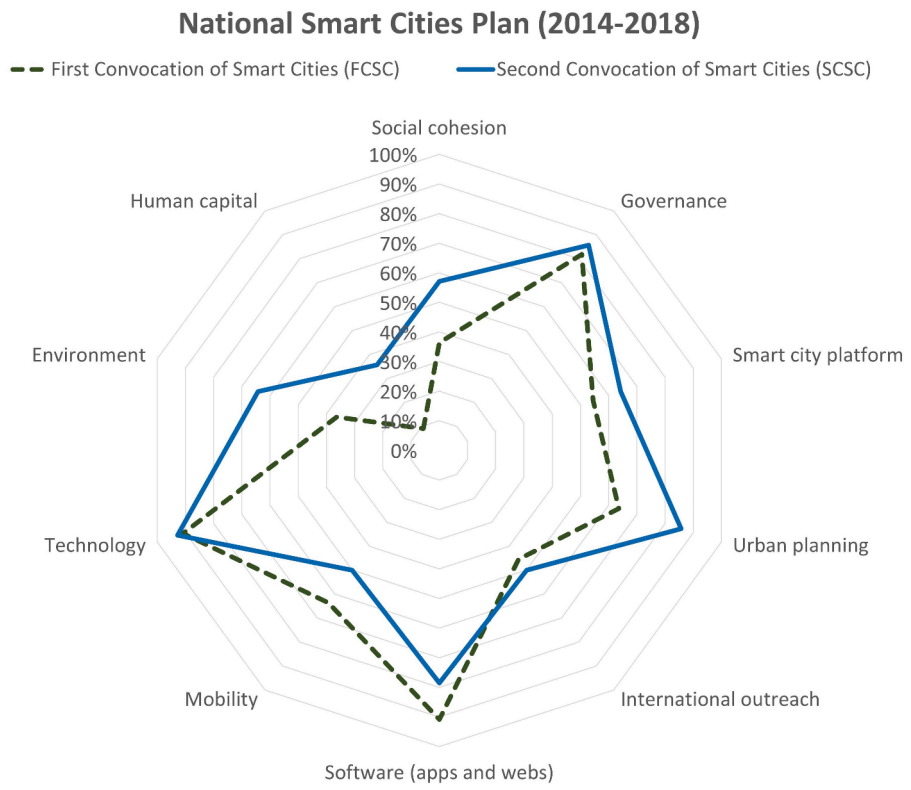

Fig. 10. List of actions presented in the SCSC summarised according to the principal areas in the smart city axes compared with those found in the FCSC.

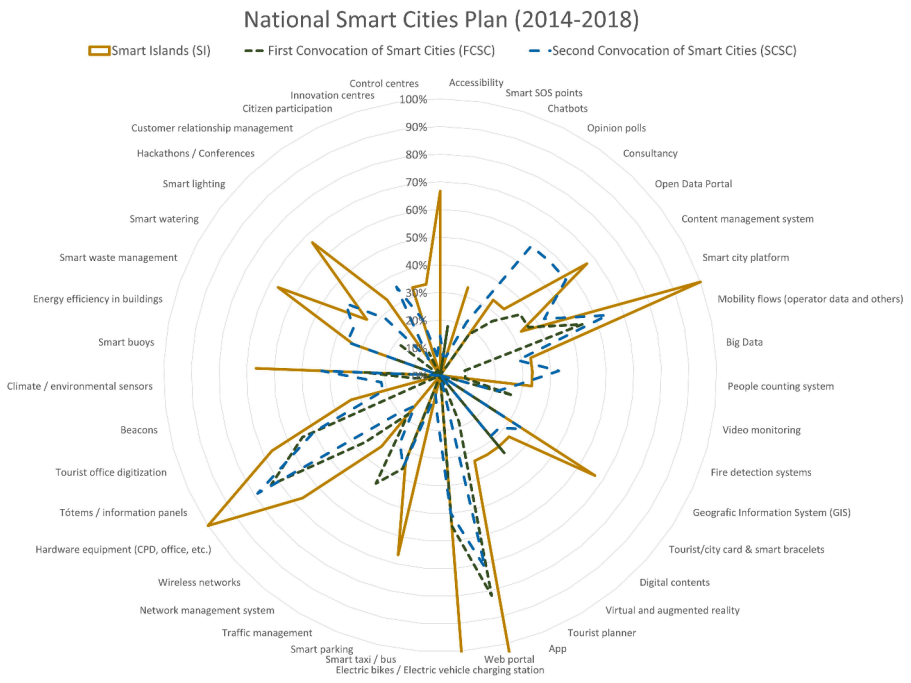

Fig. 11. Components defined in the initiatives of the Convocation of SI compared with those found in the FCSC and the SCSC.

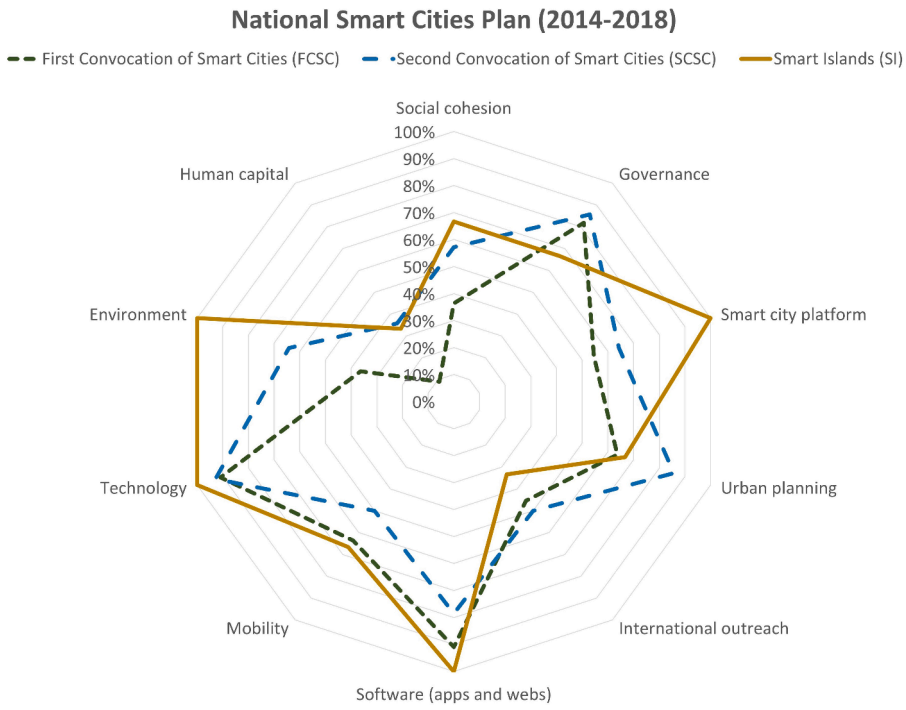

Fig. 12. List of actions presented in the convocation of SI summarised according to the principal areas in the smart city axes compared with those found in the FCSC and the SCSC.

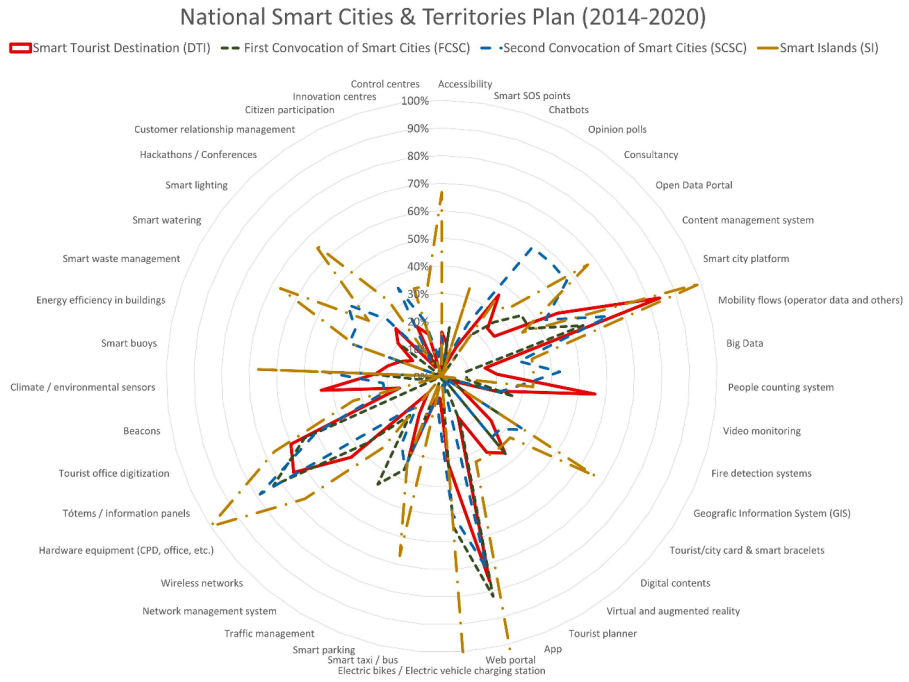

Fig. 13. Components defined in the initiatives of the CSTD and comparison with all the previous programmes.

explanation lies in the funding availability, representing the call with the highest budget per initiative nowadays. Consequently, the actions conducted classify the CSI within the second generation of smart cities according to the reference literature (Anthopoulos, 2017; Monzon, 2015; Zygiaris, 2013).

5.2. Smart territories national plan funding programmes

The STNP represents an extension of the SCNP described in the previous subsections and include the CSTI and the CSBC, which are currently in the bidding period (Red.es, 2017j, 2018m).

Actions focus on six areas: internal city objects (buildings, stations, ports, and airports), 5 G, virtual interoperability laboratory, smart rural areas, smart tourism, and public services 4.0 on city platforms (ESMARTCITY, 2018a). Additionally, they promote the impulse of normalisation (UNE 178) (Marcos Paramio, 2017; UNE, 2016a), international actions, governance of the National Plan, communication, and training for public workers.

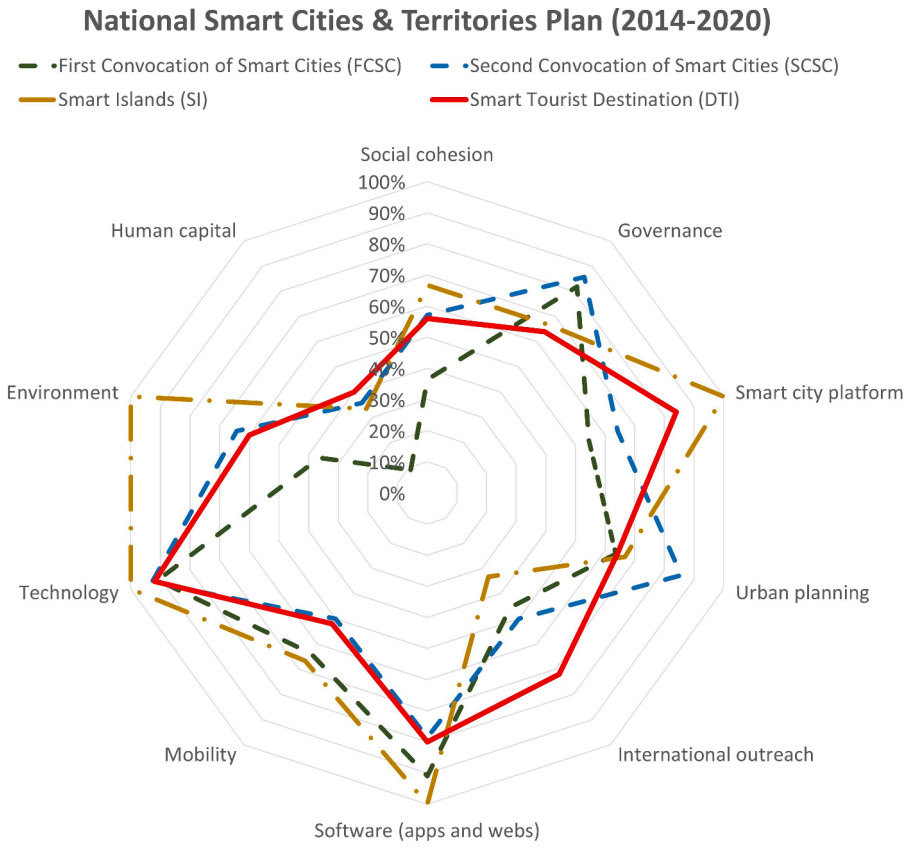

Fig. 14. List of actions presented in the CSTD summarised according to the principal areas in the smart city axes and comparison with all the previous programmes.

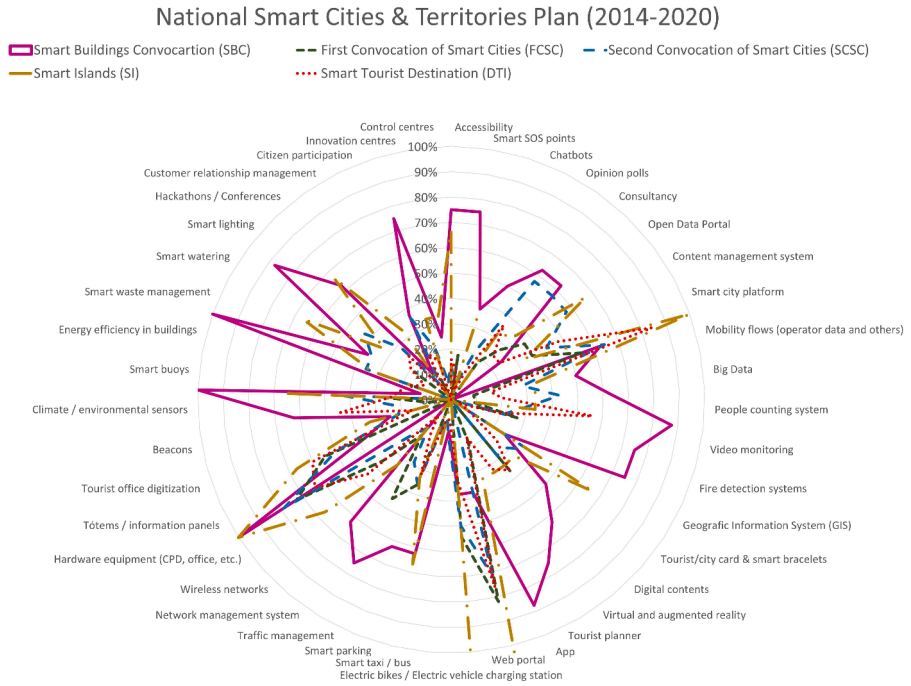

Fig. 15. Components defined in the initiatives of the CSB and comparison with all the previous programmes.

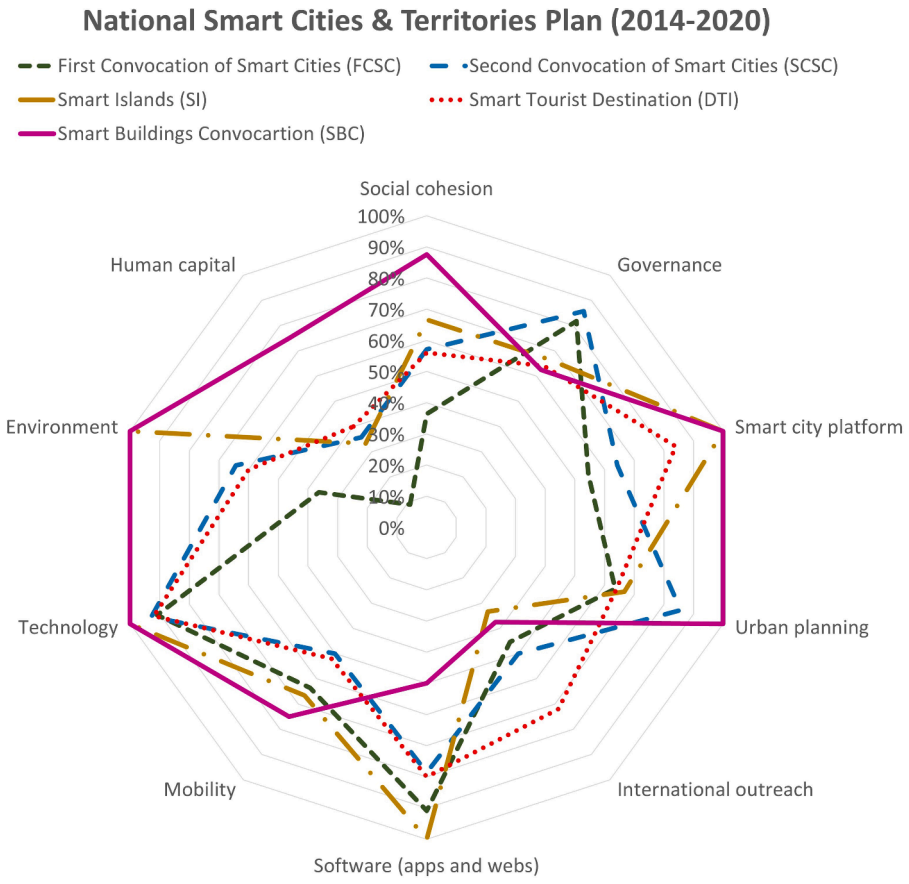

Fig. 16. List of actions presented in the CSB summarised according to the principal areas in the smart city axes and comparison with all the previous programmes.

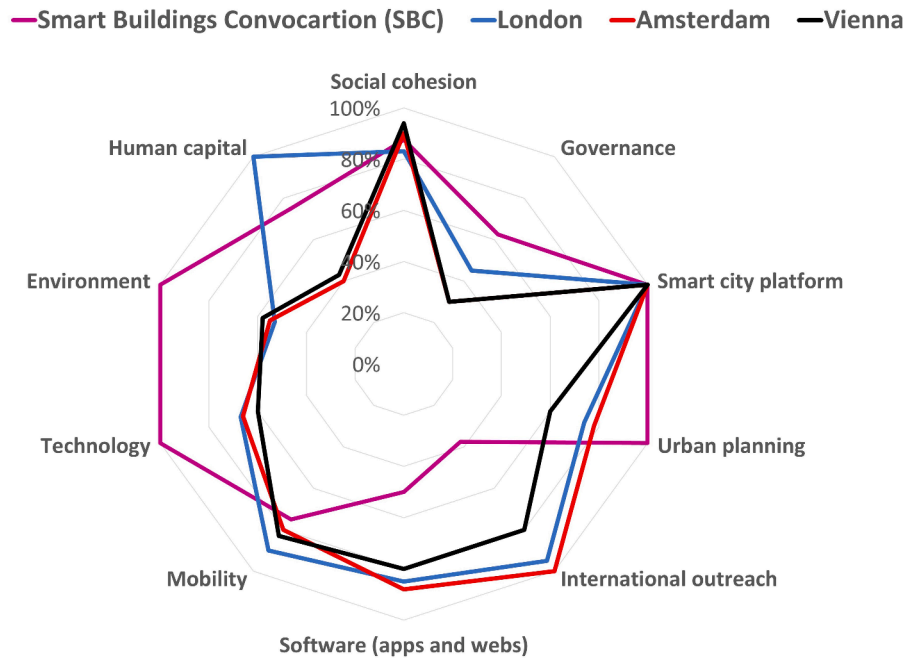

Fig. 17. Comparison between the indicators related to the axes defined for the smart city definition and evaluation found in the CSB projects and the European reference smart cities results: London, Amsterdam, and Vienna (Ricart et al., 2019).

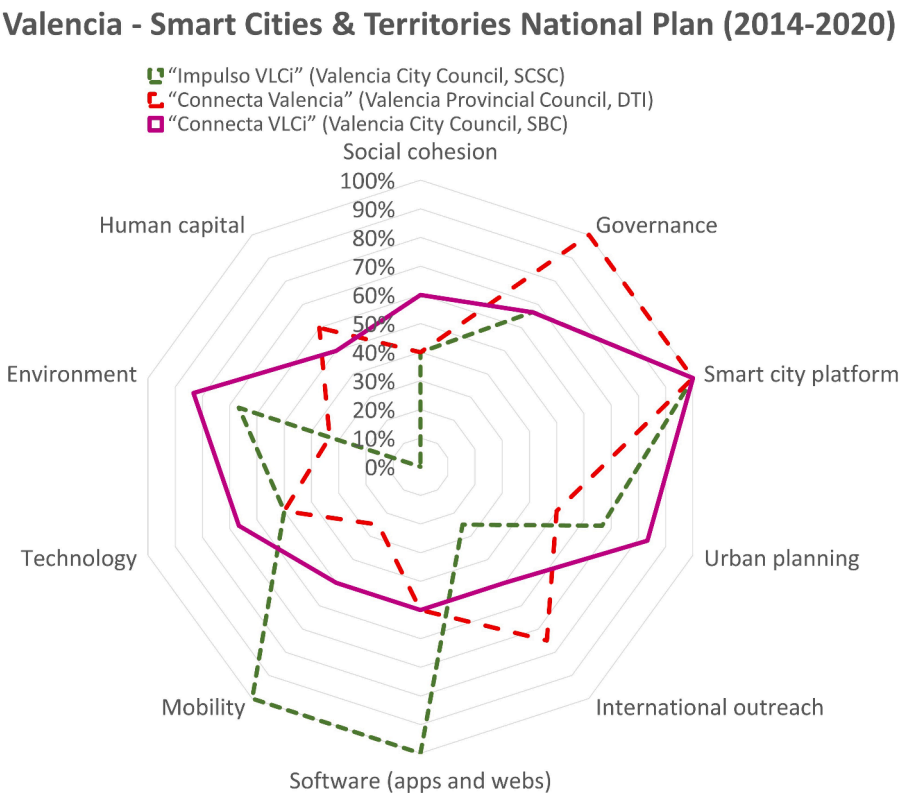

Fig. 18. Comparison between the indicators related to the axes defined for the smart city definition to analyse the evolution of the territory through the 'Impulso VLCi', 'Connecta Valencia', and 'Connecta VLCi' initiatives.

5.2.1. Smart tourist destinations

The CSTD is currently in the bidding period and comprises 25 projects in 9 autonomous communities. It has a budget of 73.97 M€. Of these, Red.es contributes a total of 45.78 M€ (61.88%), with the co-financing of the ERDF through the Multiregional Operational Program of Spain (POPE) (SEPG, 2014). Local entities will be responsible for their part (20–40% of the total estimated cost for each initiative) (Red.es, 2017k).

According to Red.es (2017k), the requirements were as follows: have more than 20,000 inhabitants registered; have been included at least once in the last ten years in the Survey of Hotel Occupation of the National Statistics Institute (INE); have not been a beneficiary of the previous calls for the Smart Cities and Islands funding programmes (Red.es, 2017k). The beneficiary locations were the City Councils of Almuñécar (Red.es, 2019r), Conil (Red.es, 2019f), Níjar (Red.es, 2019m), Roquetas de Mar (Red.es, 2019s), Adeje (Red.es, 2019a), Arona (Red.es, 2019b), Puerto de la Cruz (Red.es, 2019q), Maspalomas (Red.es, 2019l), Lloret de Mar (Red.es, 2019k), Salou (Red.es, 2019t), Benidorm (Red.es, 2019c), Plasencia (Red.es, 2019z), Ourense (Red.es, 2019o), Calviá (Red.es, 2019e), and Bilbao (Red.es, 2019d), Provincial Councils of Cádiz (Red.es, 2019x), Granada (Red.es, 2019ab), Huesca (Res.es, 2019), Alicante (Red.es, 2019y), Valencia (Red.es, 2019 g), Badajoz (Red.es, 2019p), Ourense (Red.es, 2019i), and Pontevedra (Red.es, 2019aa), Commonwealth of Do Salnes (Red.es, 2019u), and Ibiza Island Council (Red.es, 2019j).

As the name of the call of projects indicates, it differs from all the previous ones by having a greater tourist focus. This approach can be seen in Figs. 13 and 14, where it is verified how the international outreach represents the largest increase.

Another relevant detail is that many of the cities that are the object of this call have already developed projects within the scope of smart cities. This means that several of the initiatives did not start from scratch. An example is the city of Valencia, which evolved from an early technological situation that included a smart city platform (Valencia City Council, 2017), public Wi-Fi, etc.

According to the projected actions and the starting technological developments already existing in several municipalities, the group of initiatives that make up this fourth call cannot be framed together within the third generation of smart cities, in which most of them have conducted smart city projects. Hence, only the initiatives of the localities of Valencia (Red.es, 2019 g), Adeje (Red.es, 2019a), Ibiza (Red.es, 2019j), and Bilbao (Red.es, 2019d) can be considered within the group of the third generation of intelligent cities.

5.2.2. Convocation of smart buildings

The Convocation of ICO (Intelligent Buildings) has a maximum budget of 30 M€ per project (up to 19.50 M€ will be provided by Red.es and the rest by the beneficiary municipalities), co-financed by the ERDF through the POPE. This initiative focuses on developing actions to treat buildings as internal objects integrated into the smart city. The maximum budget of each pilot is 5 M€, of which Red.es will contribute 50–80%, depending on the autonomous community. The beneficiary municipality will provide the rest (20–50%) (Red.es, 2019n).

Municipalities with more than 200,000 inhabitants from five autonomous communities could opt for this financing: Andalusia, Catalonia, Valencian Community, Galicia, and Madrid. This represents 17 Spanish cities; from these, eight have been selected: Malaga, Seville, Hospitalet of Llobregat, Tarrasa, Valencia, A Coruña, Vigo, and Mostoles (Red.es, 2020). The final list was published in the Red.es Contractor Profile on 13 December 2018 (Red.es, 2018m). Airports, rail and bus stations, ports, public buildings (museums, municipal offices, sports centres, schools, markets, amongst others), and historical or residential buildings are internal city objects.

Unlike the previous call, in the CSB, one of the requirements to participate was to have an intelligent city platform. This allows predicting without going into detail on each of the projects already conducted in the field of mobility, environment, governance, etc.

Excluding software solutions and international outreach (actions

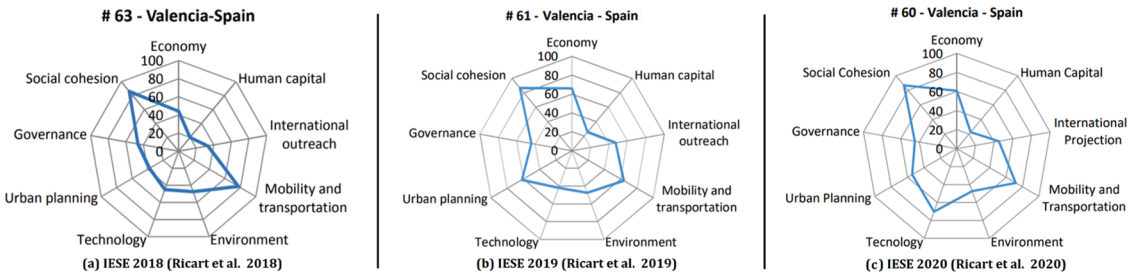

Fig. 19. IESE Cities in Motion Index evaluation for the Valencia City Council in 2018, 2019, and 2020.

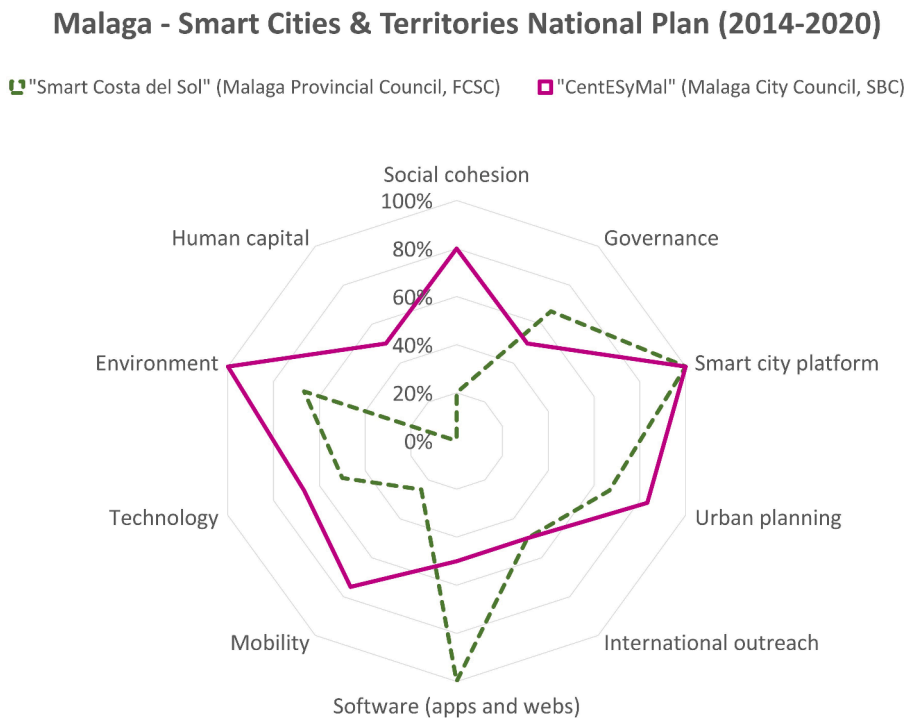

Fig. 20. Comparison between the indicators related to the axes defined for the smart city definition to analyse the territory's evolution through the 'Smart Costa del Sol' and 'CentESyMal' initiatives.

already conducted in previous projects), Figs. 15 and 16 show a greater presence in all the areas defining a smart city. A strong commitment to human capital and social cohesion can be highlighted, which are prominent areas in cities like London (see Fig. 4).

Therefore, based on what has been described in previous lines, the set of cities that made up the call for smart buildings could be a frame within the third generation of smart cities.

Finally, notably, the consolidated smart city pays interest to aspects such as social cohesion, human capital, or mobility. This coincides with the latest actions conducted in the top 10 smartest cities in the world ranking Fig. 17. shows the trend of the last call (the CSB) with the European cities used as references.

6. Case study projects

6.1. Valencia

After analysing the 61 initiatives that have been beneficiaries of both national plans, the province of Valencia has significant leadership within the country. In particular, with the projects 'Impulso VLCi'

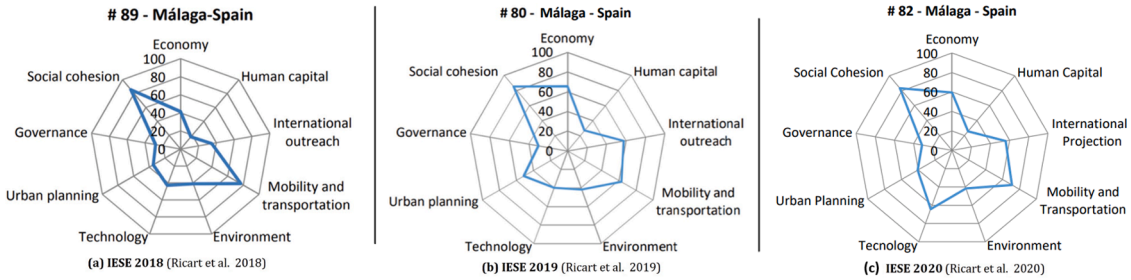

Fig. 21. IESE Cities in Motion Index evaluation for the Malaga City Council in 2018, 2019, and 2020.

(Valencia City Council, SCSC) (Red.es, 2017f; 2018c), 'Connecta Valencia' (Valencia Provincial Council, DTI) (Red.es, 2019 g), and 'Connecta VLCi' (Valencia City Council, SBC) (Red.es, 2020), the province was granted with 6.00 M€, 5.69 M€, and 5.00 M€, respectively, adding up to almost 17 M€.

The VLCi platform, created within the 'Impulso VLCi' initiative, was the first smart city platform deployed in Spain to meet the European FIWARE standard (ESMARTCITY, 2018b; 2018c). Since 2015, there has been a city dashboard with more than 550 city indicators and the different municipal services progressively integrated into the VLCi platform. Moreover, studies were conducted with Big Data tools. These analysed the mobility within the city of Valencia, with application in traffic management and the Municipal Transport Company, as well as from the perspective of tourism, to understand better visitors' patterns and mobility flow. Additionally, during this period, Valencia was certified in the ISO 37,120 standard of sustainable cities with the highest score (platinum) (ECE, 2019) and participated considerably actively in several forums (i.e. in the development and definition of the UNE 178, 201 'Smart Cities. Definition, attributes and requirements') (ESMARTCITY, 2016).

The 'Connecta Valencia' (CSTD) and 'Connecta VLCi' (CSB) initiatives results are not yet available as they are in their bidding period. However, the proposed actions can be compared with the implanted solutions. Thus, it is possible to visualise the territory's evolution, as shown in Fig. 18.

Throughout 2018–2020, the city of Valencia had been included in the IESE Cities in Motion Index (Ricart et al., 2018, 2019, 2020). It has gone from occupying the position 63rd to the 60th. It is important to highlight the performance improvement in international outreach, urban planning, and economy (see Fig. 19).

6.2. MALAGA

The second case study is the city of Malaga—the capital of the Costa del Sol—which, according to the data given by the Institute of Statistics and Cartography of Andalusia (IECA), is recognised as the economic capital of Andalusia. It has been able to benefit from both national smart city calls with the projects 'Smart Costa del Sol' (Malaga Provincial Council, FCSC) (Red.es, 2014j; 2015 g) and 'CentESyMal' (Malaga City Council, SBC) (Red.es, 2020). These projects were granted 5.80 M€ and 5.00 M€, respectively—almost 11 M€ overall. The actions and related indicators used in these initiatives are represented in Fig. 20.

As in the case of Valencia, an evolution in the IESE: Cities in Motion ranking is presented between 2018 (Ricart et al., 2018), 2019 (Ricart et al., 2019), and 2020 (Ricart et al., 2020). As shown in Fig. 21, in this city, the improvement in the index is more significant than in Valencia, as it improves from the 89th to the 82nd position. The best improvements can be found in the same areas as in Valencia: international outreach, urban planning, technology, and economy.

To raise more positions in this ranking, it is necessary to improve its international projection and human capital. Nowadays, the city is conducting important improvements in these areas. For example, the city has been chosen as the European Capital of Intelligent Tourism 2020 by the European Commission and has launched the 'Plan Estratégico de Innovación Tecnológica 2018–2022′. This is a project funding call, parallel to the SBC, with a specific budget of more than 150 M€ in which the city of Malaga will contribute to 75% of these funds (ESMARTCITY, 2018d; 2018e). This plan represents one of the most ambitious projects in the country in terms of smart city development. Therefore, results of considerable impact on the city can be forecast in the coming years.

7. Conclusions

Evidence has shown that a smart city is first a city, while smartness is another asset, which either improves/automates typical functions (transportation, waste management, etc.) or generates jobs and increases citizen satisfaction (from traffic awareness, energy efficiency, etc.).

Current smart city concepts attempt to keep leadership in urban technology projects focused on their inhabitants and their goals as a society. A comparison has been made between different models of implementation considering all the actions (components) identified in the literature and ten main smart city axes: social cohesion, governance, smart city platform, urban planning, international outreach, software (apps and webs), mobility, technology, environment, and human capital.

After analysing the main cities indexed and classified according to their initiatives to become smart entities, it is possible to conclude that there is no smart city model that considers all the ten axes in planning their actions. Each city council conducts their transformation projects in different directions and with different degrees of development according to its specific needs or the available resources.

Along with this study, a comprehensive overview of the development of smart cities in Spain has been provided to describe the degree of maturity in the transformation processes of its conventional nucleus of the population into the smart cities they plan.

This evolution follows the expected and logical trend towards digital transformation, starting by focusing actions on ICTs and e-governance (technology, software, governance, and urban planning) through two project funding calls from the national government: the FCSC and the SCSC. In this specific country, there is a greater interest in the environment and the tourist approach of the city (environment, international outreach) detailed through the specific CSTD and the CSI.

Under these programmes, the Spanish cities have focused their actions mainly on their social cohesion, urban planning, international outreach, and technology implementation. This reflects a synergistic effect of the national and regional environment in a clear commitment to tourism and quality of life.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

Funding for open access charge: University of Malaga / CBUA.

References

Advertorial, F. (2019). February 18 *Ciudades inteligentes: 5 proyectos que delinean el futuro colaborativo*. Forbes México https://www.forbes.com.mx/ciudades-inteligentes-5-proyectos-futuro/.

Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities (London, England), 60*, 234–245. https://doi.org/10.1016/j.cities.2016.09.009

Akande, A., Cabral, P., Gomes, P., & Casteleyn, S. (2019). The Lisbon ranking for smart sustainable cities in Europe. *Sustainable Cities and Society*, 44, 475–487. https://doi.org/10.1016/j.scs.2018.10.009.

Al Sharif, R., & Pokharel, S. (2021). Smart city dimensions and associated risks: Review of literature. *Sustainable Cities and Society*, Article 103542.

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology, 22*(1), 3–21. https://doi.org/10.1080/10630732.2014.942092

Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. *Cities (London, England), 89*, 80–91. https://doi.org/10.1016/j.cities.2019.01.032

Allwinkle, S., & Cruickshank, P. (2011). Creating smart-er cities: An overview. *Journal of Urban Technology, 18*(2), 1–16. https://doi.org/10.1080/10630732.2011.601103

Álvarez, C. (2019). *Holanda: La falta de espacio para aparcar más bicicletas obliga a construir aparcamientos subterráneos*. eldiario.es. https://www.eldiario.es/ballenablanca/365_dias/Holanda-espacio-construir-aparcamientos-subterraneos-bicicletas_0_853215404.html.

Angelidou, M. (2014). Smart city policies: A spatial approach. *Cities (London, England), 41*, S3–S11. https://doi.org/10.1016/j.cities.2014.06.007

Angelidou, M. (2017). The role of smart city characteristics in the plans of fifteen. *Journal of Urban Technology*. https://doi.org/10.1080/10630732.2017.1348880

Anthopoulos, L. (2017). Smart utopia VS smart reality: Learning by experience from 10 smart city cases. *Cities (London, England), 63*, 128–148. https://doi.org/10.1016/j.cities.2016.10.005

Bakıcı, T., Almirall, E., & Wareham, J. (2013). A smart city initiative: The case of Barcelona. *Journal of the Knowledge Economy, 4*(2), 135–148. https://doi.org/10.1007/s13132-012-0084-9

Batabyal, A. A., & Nijkamp, P. (2019). Creative capital, information and communication technologies, and economic growth in smart cities. *Economics of Innovation and New Technology, 28*(2), 142–155. https://doi.org/10.1080/10438599.2018.1433587

BBC. (2016). *Por qué viena es la ciudad "con mejor calidad de vida" del mundo y montevideo la mejor de américa latina*. https://www.bbc.com/mundo/noticias/2016/02/160223_viena_ciudadades_calidad_am.

Ben Letaifa, S. (2015). How to strategize smart cities: Revealing the SMART model. *Journal of Business Research, 68*(7), 1414–1419. https://doi.org/10.1016/j.jbusres.2015.01.024

Bibri, S. E., & Krogstie, J. (2017). Smart sustainable cities of the future: An extensive interdisciplinary literature review. *Sustainable Cities and Society, 31*, 183–212. https://doi.org/10.1016/j.scs.2017.02.016. ISSN 2210-6707.

Board, S. L. (2013). *Smart london plan: Using the creative power of new technologies to serve london and improve londoners' lives*.

BOE. (2015). *BOE.es—Documento BOE-A-2015-8703*. https://www.boe.es/diario_boe/txt.php?id=BOE-A-2015-8703.

BOE. (2016). *BOE.es—Documento BOE-A-2016-8373*. https://boe.es/diario_boe/txt.php?id=BOE-A-2016-8373.

BOE. (2018). *BOE.es—Documento BOE-B-2018-47787*. https://www.boe.es/diario_boe/txt.php?id=BOE-B-2018-47787.

BOE. (2019a). *BOE.es—Documento BOE-B-2019-12264*. https://www.boe.es/diario_boe/txt.php?lang=eu&id=BOE-B-2019-12264.

BOE. (2019b). *BOE.es—Documento BOE-B-2019-17594*. https://www.boe.es/diario_boe/txt.php?lang=va&id=BOE-B-2019-17594.

Business Chief. (2019). *Top 10 smart cities in europe*. https://europe.businesschief.com/top10/2606/Top-10-smart-cities-in-Europe.

Camero, A., & Alba, E. (2019). Smart city and information technology: A review. *Cities (London, England), 93*, 84–94. https://doi.org/10.1016/j.cities.2019.04.014

Castelnovo, W., Misuraca, G., & Savoldelli, A. (2016). Smart cities governance: The need for a holistic approach to assessing urban participatory policy making. *Social Science Computer Review, 34*(6), 724–739. https://doi.org/10.1177/0894439315611103

Cohen, B., & Cohen, B. (2012,. January 11). *The Top 10 Smart Cities On The Planet*. Fast Company. https://www.fastcompany.com/90186037/the-top-10-smart-cities-on-the-planet.

Coleman, E., & Goldstein, B. (2013). Lessons from the London Datastore. *Beyond Transparency: Open Data and the Future of Civic Innovation*, 39–50.

CONSTRUIBLE. (2008). *Cisco ayuda a los municipios a desarrollar entornos laborales sostenibles con su iniciativa "Smart work center"*.CONSTRUIBLE. https://www.construible.es/2008/10/08/cisco-ayuda-a-los-municipios-a-desarrollar-entornos.

Contreras, G., & Platania, F. (2019). Economic and policy uncertainty in climate change mitigation: The London Smart City case scenario. *Technological Forecasting and Social Change, 142*, 384–393. https://doi.org/10.1016/j.techfore.2018.07.018

Cuvero, M., Granados, M. L., Pilkington, A., & Evans, R. D. (2019). The effects of knowledge spillovers and accelerator programs on the product innovation of high-tech start-ups: A multiple case study. *IEEE Transactions on Engineering Management*, 1–14. https://doi.org/10.1109/TEM.2019.2923250

Da Graça Carvalho, M. (2012). EU energy and climate change strategy. *Energy, 40*(1), 19–22. https://doi.org/10.1016/j.energy.2012.01.012

Dall'O', G., Bruni, E., Panza, A., Sarto, L., & Khayatian, F. (2017). Evaluation of cities' smartness by means of indicators for small and medium cities and communities: A methodology for Northern Italy. *Sustainable Cities and Society, 34*, 193–202. https://doi.org/10.1016/j.scs.2017.06.021. PagesISSN 2210-6707.

Dameri, R., & Cocchia, A. (2013). *Smart city and digital city: Twenty years of terminology evolution*, 1–8.

Dameri, R. P. (2014). Comparing smart and digital city: Initiatives and strategies in Amsterdam and Genoa. Are they digital and/or smart?R. P. Dameri, & C. Rosenthal-Sabroux (Eds.), Comparing smart and digital city: Initiatives and strategies in Amsterdam and Genoa. Are they digital and/or smart?. *Smart city: How to create public and economic value with high technology in urban space*, 45–88. https://doi.org/10.1007/978-3-319-06160-3_3

De la Quadra-Salcedo, & Fernández del Castillo, T. (2009). *Las fases de la contratación: Selección y adjudicación, formalización, ejecución y extinción de los contratos*, 42. http://ocw.uc3m.es/derecho-administrativo/contratacion-y-medios-de-las-administraciones-publicas-2013/resumenes-de-contenidos/Leccion_3.pdf. http://ocw.uc3m.es/derecho-administrativo/contratacion-y-medios-de-las-administraciones-publicas-2013/resumenes-de-contenidos/Leccion_3.pdf.

Deakin, M., & Waer, H. A. (2011). From intelligent to smart cities. *Intelligent Buildings International, 3*(3), 140–152. https://doi.org/10.1080/17508975.2011.586671

Del Chiappa, G., & Baggio, R. (2015). Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *Journal of Destination Marketing & Management, 4*(3), 145–150. https://doi.org/10.1016/j.jdmm.2015.02.001

Desdemoustier, J., Crutzen, N., Cools, M., & Teller, J. (2019). Smart city appropriation by local actors: An instrument in the making. *Cities (London, England), 92*, 175–186. https://doi.org/10.1016/j.cities.2019.03.021

Duygan, M., Fischer, M., Pärli, R., & Ingold, K. (2021). Where do smart cities grow? The spatial and socio-economic configurations of smart city development. *Sustainable Cities and Society*, Article 103578.

ECE, U.N. (.2019). *Standards for the sustainable development goals*. United Nations.

EDUSI. (2019). Desarrollo Urbano Sostenible | EDUSI. http://edusi.es/content/desarrollo-urbano-sostenible.

El Huffington Post. (2019). *Esta es la mejor ciudad del mundo para vivir en 2019*. El Huffington Post. https://www.huffingtonpost.es/entry/viena-es-la-mejor-ciudad-del-mundo-para-vivir-en-2019_es_5cb42b48e4b082aab088088f.

ESMARTCITY. (2014). *Amsterdam smart city, por la sostenibilidad y un mayor nivel de vida • esmartcity*. ESMARTCITY. https://www.esmartcity.es/2014/01/30/amsterdam-smart-sity-por-la-sostenibilidad-y-un-mayor-nivel-de-vida.

ESMARTCITY. (2016,. April 27). *AENOR normaliza y estandariza lo que ha de ser una ciudad inteligente • esmartcity*. ESMARTCITY. https://www.esmartcity.es/2016/04/28/aenor-normaliza-y-estandariza-lo-que-ha-de-ser-una-ciudad-inteligente.

ESMARTCITY. (2018a). *El ministerio de energía, turismo y agenda digital aprueba el plan nacional de territorios inteligentes • esmartcity*. ESMARTCITY. https://www.esmartcity.es/2018/01/08/ministerio-energia-turismo-agenda-digital-aprueba-plan-nacional-territorios-inteligentes.

ESMARTCITY. (2018b). *Fiware: Una plataforma abierta y estándar para ciudades inteligentes • esmartcity*. ESMARTCITY. https://www.esmartcity.es/comunicaciones/i-congreso-ciudades-inteligentes-fiware.

ESMARTCITY. (2018c). *Impulso VLCi: Despliegue iot y extensión del proyecto valencia smart city • esmartcity*. ESMARTCITY. https://www.esmartcity.es/comunicaciones/comunicacion-impulso-vlci-despliegue-iot-extension-proyecto-valencia-smart-city.

ESMARTCITY. (2018d,. May 10). *Málaga tiene un plan para ser ciudad inteligente y tecnológica en 2022 con una inversión de 155 millones de euros • esmartcity*. ESMARTCITY. https://www.esmartcity.es/2018/05/10/malaga-tiene-plan-ser-ciudad-inteligente-tecnologica-2022-inversion-155-millones-euros.

ESMARTCITY. (2018e,. September 3). *Málaga desarrollará más de 200 proyectos de innovación tecnológica en la ciudad hasta 2022 • esmartcity*. ESMARTCITY. https://www.esmartcity.es/2018/09/03/malaga-desarrollara-mas-200-proyectos-innovacion-tecnologica-ciudad-2022.

EU. (2010). *Europa 2020: La estrategia de la unión europea para el crecimiento y la ocupación*. https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=LEGISSUM%3Aem0028.

EU. (2019). *European green capital*. https://ec.europa.eu/environment/europeangreencapital/europeangreenleaf/.

Communi, C. A. of I., Facili, E.-C. P. D. S. (2015). *Comparative study of smart cities in europe and china 2014*. Springer.

Fernandez-Anez, V. (2016). Stakeholders approach to smart cities: A survey on smart city definitions. In E. Alba, F. Chicano, & G. Luque (Eds.), *Smart cities* (pp. 157–167). Springer International Publishing.

Fernández-Áñez, V., & Fernández-Güell, J. M. (2019). *Pasado presente y futuro de las ciudades inteligentes: Una visión integrada*, 40–45. https://www.congreso-ciudades-inteligentes.es/.

Fernandez-Anez, V., Fernández-Güell, J. M., & Giffinger, R. (2018). Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. *Cities (London, England), 78*, 4–16. https://doi.org/10.1016/j.cities.2017.12.004

Fernández-Áñez, V., Fernández-Guell, J. M., Giffinger, R., & Polleti, A. (2018). Ciudad inteligente y visión integrada: Barcelona, Milán y Viena. *ESMARTCITY*. https://www.esmartcity.es/comunicaciones/comunicación-ciudad-inteligente-vision-integrada-barcelona-milan-viena.

Forbes. (2009). *The world's smartest cities*. https://www.forbes.com/2009/12/03/infrastructure-economy-urban-opinions-columnists-smart-cities-09-joel-kotkin.html#81bd3cf5bc1c.

Forbes. (2016). *Ranking the world's "Smartest" cities*. Forbes. https://www.forbes.com/sites/iese/2016/07/06/the-worlds-smartest-cities/.

Gibson, J., Robinson, M., & Cain, S. (2015). *CITIE: A resource for city leadership*. Nesta. https://www.nesta.org.uk/report/citie-a-resource-for-city-leadership/.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Milanović, N., & Meijers, E. (2007). *Smart cities—Ranking of European medium-sized cities*.

Hopkins, D., & Schwanen, T. (2018). Governing the Race to Automation. In M. Greg, & R. Louise (Eds.), *Governance of the smart mobility transition* (pp. 65–84). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78754-317-120181005.

Huovila, A., Bosch, P., & Airaksinen, M. (2019). Comparative analysis of standardized indicators for smart sustainable cities: What indicators and standards to use and when? *Cities (London, England), 89*, 141–153. https://doi.org/10.1016/j.cities.2019.01.029

Ibrahim, M., El-Zaart, A., & Adams, C. (2018). Smart sustainable cities roadmap: Readiness for transformation towards urban sustainability. *Sustainable Cities and Society. Volume, 37*, 530–540. https://doi.org/10.1016/j.scs.2017.10.008. PagesISSN 2210-6707.

Innovotics. (2019). Las cinco smart cities europeas. *Innovotics | Especialistas en Domótica y Automatización Industrial*. https://innovotics.es/smart-cities-europeas/.

ISO. (2014). *Smart cities preliminary report 2014. International Standards Organization (ISO)*. http://www.iso.org/iso/smart_cities_report-jtc1.pdf.

ISSUU. (2011). *Amsterdam smart city*. Issuu. https://issuu.com/amsterdamsmartcity/docs/smart_stories.

ITU. (2018a). *ITU-T Y.4200 (02/2018). requirements for the interoperability of smart city platforms*. ITU. https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=13387&lang=en.

ITU. (2018b). *ITU-T Y.4201: High-level requirements and reference framework of smart city platforms*. https://www.itu.int/rec/T-REC-Y.4201-201802-I/en.

ITU. (2018c). *Y.4201: Requisitos de alto nivel y marco de referencia de las plataformas de ciudad inteligente*. https://www.itu.int/rec/T-REC-Y.4201-201802-I/es.

Jensen, J.S., .Cashmore, M., & Späth, P. (2018). *The politics of urban sustainability transitions: Knowledge, power and governance*. Routledge.

Jiménez, M. (2019). *España acelera para ser una potencia en 'smart cities*. February 14. El País https://cincodias.elpais.com/cincodias/2019/02/13/companias/1550087546_822671.html.

Joss, S., Cook, M., & Dayot, Y. (2017). Smart Cities: Towards a New Citizenship Regime? A Discourse Analysis of the British Smart City Standard. *Journal of Urban Technology, 24*(4), 29–49. https://doi.org/10.1080/10630732.2017.1336027.

Joss, S., Sengers, F., Schraven, D., Caprotti, F., & Dayot, Y. (2019). The smart city as global discourse: Storylines and critical junctures across 27 cities. *Journal of Urban Technology, 26*(1), 3–34. https://doi.org/10.1080/10630732.2018.1558387

Jucevicius, R., Patašienė, I., & Patašius, M. (2014). *Digital dimension of smart city: Critical analysis.* 156, 146–150.

Khan, A., Aslam, S., Aurangzeb, K., Alhussein, M., & Javaid, N. (2022). Multiscale modeling in smart cities: A survey on applications, current trends, and challenges. *Sustainable Cities and Society, 78*, Article 103517.

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal, 79*(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8

König, A., & Evans, J. (2013). *Experimenting for sustainable development? living laboratories, social learning, and the role of the university*.

Kylili, A., & Fokaides, P.A. (.2015). European smart cities: The role of zero energy buildings. *Sustainable Cities and Society*, 15, 86–95. https://doi.org/10.1016/j.scs.2014.12.003.

Lombardi, P., Giordano, S., Caragliu, A., Del Bo, C., Deakin, M., Nijkamp, P. et al. (2011). *An advanced triple-helix network model for smart cities performance.* http://degree.ubvu.vu.nl/repec/vua/wpaper/pdf/20110045.pdf.

López, P.por D. (2019). El futuro de las ciudades ya existe: Estas tres 'smart cities' nos lo muestran. *El blog de Orange*. http://blog.orange.es/otros/ciudades-mas-inteligentes/.

Madreiter, T., & Haunold, V. (2012). *Smart city vienna: Sustainable success* (pp. 35–40). Austria, Vienna: Schmid Verlag.

Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., & K. otterink, B. (2014). *Mapping smart cities in the EU*. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf.

Marcos Paramio, T. (2017). *El modelo de normalización español de ciudades inteligentes (UNE, ctn 178) y su impacto internacional • esmartcity*. ESMARTCITY. https://www.esmartcity.es/comunicaciones/comunicacion-modelo-normalizacion-espanol-ciudades-inteligentes.

MASCHIO, I. (2016). *European innovation partnership on smart cities and communities* [Text]. https://e3p.jrc.ec.europa.eu/articles/european-innovation-partnership-smart-cities-and-communities.

McLaren, D., & Agyeman, J. (2015). *Sharing cities: A case for truly smart and sustainable cities*. MIT Press.

Mediafeed. (2016). *Free wifi in exchange for clean air in the city*. Mediafeed. Mediafeed.Co.. | https://www.mediafeed.co/free-wifi-in-exchange-for-clean-air-in-the-city/.

Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: A review of the literature on smart urban governance. *International Review of Administrative Sciences, 82*(2), 392–408. https://doi.org/10.1177/0020852314564308

Michelet, A. (2012). Un voyage dans les Smart Work Center (SWC) d'Amsterdam. *territoire entrepreneurial.* https://territoireentrepreneurial.wordpress.com/2012/03/31/un-voyage-dans-les-smart-work-center-swc-damsterdam/.

Ministerio de Industria, Energía y Turismo. (2013). *Agenda digital para españa*. https://www.comparaiso.es/agenda-digital.

Monzon, A. (2015). Smart cities concept and challenges: Bases for the assessment of smart city projects. In *2015 International Conference on Smart Cities and Green ICT Systems (SMARTGREENS)* (pp. 1–11).

Mora, L., & Bolici, R. (2017). How to become a smart city: Learning from Amsterdam. In A. Bisello, D. Vettorato, R. Stephens, & P. Elisei (Eds.), *Smart and sustainable planning for cities and regions: Results of sspcr 2015* (pp. 251–266). Springer International Publishing. https://doi.org/10.1007/978-3-319-44899-2_15.

Mora, L., Bolici, R., & Deakin, M. (2017). The first two decades of smart-city research: A bibliometric *analysis*. *Journal of Urban Technology, 24*(1), 3–27. https://doi.org/10.1080/10630732.2017.1285123

Mora, L., Deakin, M., & Reid, A. (2019). Strategic principles for smart city development: A multiple case study analysis of European best practices. *Technological Forecasting and Social Change, 142*, 70–97. https://doi.org/10.1016/j.techfore.2018.07.035

Morganti, L., & Donders, K. (2014). A digital agenda in search of evidence. *Info*. https://doi.org/10.1108/INFO.27216aaa.001.

Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th annual international digital government research conference: digital government innovation in challenging times* (pp. 282–291). https://doi.org/10.1145/2037556.2037602

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in smart city initiatives: Some stylized facts. *Cities (London, England), 38*, 25–36. https://doi.org/10.1016/j.cities.2013.12.010

Neuroni, A. C., Haller, S., van Winden, W., Carabias-Hütter, V., & Yildirim, O. (2019). Public value creation in a smart city context: An analysis frameworkM. P. Rodriguez Bolivar (Ed.), Public value creation in a smart city context: An analysis framework. *Setting foundations for the creation of public value in smart cities*, 49–76. https://doi.org/10.1007/978-3-319-98953-2_3

Numbeo. (2016). *Europe: Quality of life index 2015*. https://www.numbeo.com/quality-of-life/region_rankings.jsp?.title=2015&region=150.

Olleros, F. X., & Zhegu, M. (2016). *Research handbook on digital transformations*. Edward Elgar Publishing.

Pérez-González, D., & Díaz-Díaz, R. (2015). *Public Services Provided with ICT in the Smart City Environment: The Case of Spanish Cities, 21*(2), 248–267.

Phenix, M. (2014). *Hands off with heathrow's autonomous pod cars*. BBC. http://www.bbc.com/autos/story/20140910-hands-off-with-heathrows-pods.

Potter, S., Valdez, A., Cook, M., & Langendahl, P.-. A. (2015). In *Governance in niche development for a transition to a new mobility regime. International Sustainability Conference 2015*. University of Sussex. http://www.ist2015.org/.

Pozdniakova, A. M. (2018). Smart city strategies "London-Stockholm-Vienna-Kyiv. *Acta Innovations, 27*, 31–45.

Rªd.es. (2015a). *1a convocatoria ciudades inteligentes | red.es*. https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/1%C2%AA-convocatoria-ciudades-inteligentes.

Rªd.es. (2016a). *2a convocatoria ciudades inteligentes | red.es*. https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/proyectos-en-ciudades.

Rªd.es. (2017a). *Alicante se mueve: Being Smart.Informative Dossier.*https://www.red.es/redes/sites/redes/files/alicante.pdf.

Rªd.es. (2018a). *Desarrollo de la iniciativa Alicante se mueve. Expediente: 099/18-SP. Alicante City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfljU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjyxJVDcqLyi0ynJ2Ci6qM3QNTTIvMggNtbfULcnMdAcwKdFE!/.

Rªd.es. (2019a). *Adeje DTI, Destino Turístico Inteligente. Informative Dossier. Adeje City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20ADEJE.pdf.

Red.es. (2014a). *Alba Smart 2020. Informative Dossier. Red.es. Ministry of Economy and Business. Spanish Government.*https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/1%C2%AA-convocatoria-ciudades-inteligentes?qt-view_sub_programas_block_2=10#qt-view_sub_programas_block_2.

Red.es. (2014b). *Alcalá La Real, Ciudad y Destino Inteligente. Dossier.*http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/EX-15038/v4-dosier-Alcala-la-real.pdf.

Red.es. (2014c). *Granada Human Smart City. Informative Dossier.*http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/Portal_Redes/2017/Mayo/GRANADA.PDF.

Red.es. (2014d). *Huelva Smart City Route. Informative Dossier.*http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/EX-15114/v3-huelva-ciudades_inteligentes.pdf.

Red.es. (2014e). *Lepe Smart Turismo y Gobernanza Transparente. Informative Dossier.* http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/Portal_Redes/2018/Septiembre/version4_Lepe-ciudades_inteligentes.pdf.

Red.es. (2014f). *Martos Ciudad Inteligente. Informative Dossier.*https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/1%C2%AA-convocatoria-ciudades-inteligentes?qt-view_sub_programas_block_2=6#qt-view_sub_programas_block_2.

Red.es. (2014 g). *PRIMERA convocatoria de ciudades inteligentes de la agenda digital para ESPAÑA. C019/14-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=607&visualizar=0.

Red.es. (2014 h). *Procedimiento de selección de los Ayuntamientos participantes en la primera Convocatoria de ciudades inteligentes de la agenda digital para España. Expediente: C019/14-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=607&visualizar=0.

Red.es. (2014i). *Sevilla smart accessibility & tourist & events. informative dossier.*http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2//SDOM-55/Sevilla_v4_ciudades_inteligentes.pdf.

Red.es. (2014j). *Smart Costa del Sol. Informative Dossier.*https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/1%C2%AA-convocatoria-ciudades-inteligentes?qt-view_sub_programas_block_2=2#qt-view_sub_programas_block_2.

Red.es. (2014k). *Smartdepeñas. informative dossier*. http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/SRED-296/V3.pdf.

Red.es. (2014l). *Toledo ciudad inteligente. informative dossier*. http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/SRED-291/dosier_toledo_ciudades_inteligentes_final.pdf.

Red.es. (2014 m). *Villanueva de la serena smart city. informative dossier*. http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/EX-10666/v4_villanueva_de_la_serena_ONLINE.pdf.

Red.es. (2015b). *CONVOCATORIA de concesión de ayudas para el desarrollo del programa de ciudades inteligentes de la agenda digital para ESPAÑA. C059/15-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=2932&visualizar=0.

Red.es. (2015c). *Convocatoria de concesión de ayudas para el desarrollo del programa de ciudades inteligentes de la agenda digital para españa. expediente: C059/15-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=2932&visualizar=0.

Red.es. (2015d). *CONVOCATORIA de concesión de ayudas para el desarrollo del programa de islas inteligentes de la agenda digital para ESPAÑA. C055/15-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=2931&visualizar=0.

Red.es. (2015e). *Convocatoria de concesión de ayudas para el desarrollo del programa de islas inteligentes de la agenda digital para españa. expediente: C055/15-AE*. https://perfi

lcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=2931&visualizar=0.
Red.es. (2015f). *Desarrollo de la iniciativa granada human smart city*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=B044E8A06315607E65B79066A2B6C4F6.contratante01?idLicitacion=3851&visualizar=0.
Red.es. (2015 g). *Desarrollo de la iniciativa smart costa del sol. expediente: 085/17-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=44FF7F8AB7CEE445B0AAC15D6024782E.contratante01?idLicitacion=6165&visualizar=0.
Red.es. (2015 h). *Plan nacional de ciudades inteligentes | red.es*. https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/plan-nacional-de-ciudades-inteligentes.
Red.es. (2016b). *Cáceres patrimonio inteligente. Informative dossier. caceres city council. red.es. second convocation of smart cities. Smart Cities National Plan. Spanish Government* https://www.red.es/redes/sites/redes/files/caceres_2.pdf.
Red.es. (2016c). *Desarrollo de la iniciativa martos smart city. expediente: 163/15-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=4030&visualizar=0.
Red.es. (2016d). *El hierro en red. informative dossier. el hierro island council. red.es. convocation of smart islands. Smart Cities National Plan. Spanish Government* https://www.red.es/redes/sites/redes/files/el_hierro4web.pdf.
Red.es. (2016e). *Islas Inteligentes | Red.es*. https://www.red.es/redes/es/que-hacemos/ciudades-inteligentes/islas-inteligentes.
Red.es. (2016f). *LPA Inteligencia Azul. Informative Dossier. Las Palmas City Council.*https://www.red.es/redes/sites/redes/files/las_palmas_2.pdf.
Red.es. (2016 g). *Ponferrada 3.0. Administración inteligente para ciudades inteligentes. Informative Dossier. Ponferrada City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government*. https://www.red.es/redes/sites/redes/files/ponferrada_3.pdf.
Red.es. (2016 h). *Smart digital Segovia. Informative Dossier. Segovia City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.* https://www.red.es/redes/sites/redes/files/segovia.pdf.
Red.es. (2016i). *Smart Island Mallorca. Informative Dossier. Mallorca Island Council. Red.es. Convocation of Smart Islands. Smart Cities National Plan. Spanish Government.* https://www.red.es/redes/sites/redes/files/mallorca5_0.pdf.
Red.es. (2017b). *Desarrollo de la Iniciativa LPA Inteligencia Azul. Exp: 092/17-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6045&visualizar=0.
Red.es. (2017c). *Desarrollo de la Iniciativa Toledo Ciudad Inteligente. Expediente: 054/16-AE*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=96F79C8351EA5A359371B243BB78D357.contratante01?idLicitacion=4692&visualizar=0.
Red.es. (2017d). Fuerteventura open i-Sland. Informative Dossier. Fuerteventura Island Council. Red.es. Convocation of Smart Islands. *Smart Cities National Plan. Spanish Government.* https://www.red.es/redes/sites/redes/files/fuerteventura5.pdf.
Red.es. (2017e). *GIJON-IN: Ciudad Inteligente, Innovadora e Integradora. Informative Dossier.*https://sedeelectronica.gijon.es/page/15973-iniciativa-gijon-in.
Red.es. (2017f). *IMPULSO VLCi. Informative Dossier. Valencia City Council.*https://www.red.es/redes/sites/redes/files/valencia.pdf.
Red.es. (2017 g). *Mimurcia, tu ayuntamiento inteligente, cercano, abierto e innovador. Informative Dossier. Murcia City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://www.red.es/redes/sites/redes/files/murcia4.pdf.
Red.es. (2017 h). *Municipios cordobeses inteligentes y sostenibles. Informative Dossier. Córdoba Provincial Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://www.red.es/redes/sites/redes/files/cordoba_2_0.pdf.
Red.es. (2017i). *Plataforma de gobierno abierta, colaborativa e interoperable', proyecto conjunto de los ayuntamientos de a coruña. Madrid, Santiago de Compostela y Zaragoza. Informative Dossier* http://ondemand2.redes.ondemand.flumotion.com/redes/ondemand2/Portal_DSN/Marzo_2017/Coruna_Madrid_Santiago_Zaragoza.pdf.
Red.es. (2017j). *RESOLUCIÓN de la entidad pública empresarial red.es por la que se convoca la concesión de ayudas para el desarrollo del plan nacional de territorios inteligentes de la agenda digital para españa destinos turísticos INTELIGENTES. C037/17-SP*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6565&visualizar=0.
Red.es. (2017k). *RESOLUCIÓN de la entidad pública empresarial red.es por la que se establecen las bases reguladoras de la convocatoria del plan nacional de territorios inteligentes de la agenda digital para españa destinos turísticos INTELIGENTES. C037/17-SP*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6565&visualizar=0.
Red.es. (2017l). *S2city-sistema inteligente de servicios al ciudadano y al turista. Informative Dossier. Valladolid City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://www.red.es/redes/sites/redes/files/valladolid.pdf.
Red.es. (2017 m). *Santander Smart Citizen.*https://www.red.es/redes/sites/redes/files/santander.pdf.
Red.es. (2017n). *Servicio de desarrollo de la iniciativa Cáceres Patrimonio Inteligente. Expediente: 094/17-AE. Caceres City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=29EC73C547390160B8005ACDBB940ED9.contratante01?idLicitacion=6247&visualizar=0.
Red.es. (2018b). *Desarrollo de la Iniciativa DIGIPAL. Exp: 130/17-SP*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=2997DE1AC0C2717EA848038D37E2936D.contratante01?idLicitacion=7108&visualizar=0.
Red.es. (2018c). *Desarrollo de la iniciativa Impulso VLCi. Expediente: 113/17-SP*. https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=CEFE3BB27CDB2CEB00B67E6A3476D19F.contratante01?idLicitacion=6765&visualizar=0.
Red.es. (2018d). *Desarrollo de la Iniciativa LUGO SMART. Expediente: 109/17-SP*. https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfIjU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjI0LMw0JcIo1MtLMDvY1CXNMi3Cu1HW1t9Qtycx0BmRSWEg!!/.
Red.es. (2018e). *Desarrollo de la iniciativa MiMurcia: Tu Ayuntamiento Inteligente, Cercano, Abierto e Innovador en red. Expediente: 034/18-SP. Murcia City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.* https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfIjU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjQyKdPUP9sky1yzyDS9OLSxyd3ItMHW1t9Qtycx0BC_xJMQ!!/.
Red.es. (2018f). *Desarrollo de la iniciativa municipios cordobeses inteligentes y sostenibles. Expediente: 066/18-SP. Córdoba Provincial Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.* https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfIjU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjI9yLk3IsAiyTi7OdAoKcKqJM8rxUDdJtbfULcnMdAbwDSzo!/.
Red.es. (2018 g). *Desarrollo de la iniciativa: Plataforma de Gobierno Abierto, Colaborativa e interoperable. Expediente: 121/17-SP. Commonwealth of A Coruña, Madrid, Santiago de Compostela y Zaragoza. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.* https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6707.
Red.es. (2018 h). *Desarrollo de la Iniciativa PONFERRADA 3.0: Administración Inteligente para Ciudades Inteligentes. Expediente: 124/17-SP 2018. Ponferrada City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.* https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action;jsessionid=CEFE3BB27CDB2CEB00B67E6A3476D19F.contratante01?idLicitacion=6766&visualizar=0.
Red.es. (2018i). *Desarrollo de la iniciativa S2CITY – sistema inteligente de servicios al ciudadano y al turista. Valladolid City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfIjU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjk9IttAOSnVJKUwzNMyxMVQ0KcnOL08ptbfWBDEcAYKUSsg!!/.
Red.es. (2018j). *Desarrollo de la iniciativa Santander Smart CITIZEN. Expediente: 090/18-SP.*https://www.red.es/redes/sites/redes/files/santander.pdf.
Red.es. (2018k). *Desarrollo de la iniciativa SMART DIGITAL SEGOVIA. Segovia City Council. Expediente: 103/17-SP. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6767&visualizar=0.
Red.es. (2018l). *DIGIPAL. Informative Dossier. Palencia City Council. Red.es. Second Convocation of Smart Cities. Smart Cities National Plan. Spanish Government.*https://www.red.es/redes/sites/redes/files/ciudades%20inteligentes%20palencia%20-%20v3.pdf.
Red.es. (2018 m). *Resolución de la Entidad Pública Empresarial Red.es por la que se establecen las bases reguladoras de la Convocatoria del Plan Nacional de Territorios Inteligentes de la Agenda Digital para España Pilotos de Edificios Inteligentes. Red.es. Smart Territories National Plan. Spanish Government.*https://perfilcontratante.red.es/perfilcontratante/busqueda/DetalleLicitacionesDefault.action?idLicitacion=6665&visualizar=0.
Red.es. (2018n). *Servicio de desarrollo de la iniciativa Smart Island Mallorca. Expediente: 055/18-SP. Mallorca Island Council. Red.es. Convocation of Smart Islands. Smart Cities National Plan. Spanish Government.*https://contrataciondelestado.es/wps/wcm/connect/6418a297-6ea3-40c1-8502-449b68bb16a2/DOC_CD2018-359258.pdf?MOD=AJPERES.
Red.es. (2019aa). *Tourist Inside Rías Baixas. Informative Dossier. Pontevedra Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20R%C3%8DAS%20BAIXAS.pdf.
Red.es. (2019ab). *TurInGranada: Turismo Inteligente en Granada. Informative Dossier. Granada Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20GRANADA.pdf.
Red.es. (2019b). *Arona Destino Turístico Inteligente. Informative Dossier. Arona City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Dossier%20Iniciativa%20ARONA.pdf.
Red.es. (2019c). *Benidorm, Destino Turístico Inteligente y Sostenible. Informative Dossier. Benidorm City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20BENIDORM.pdf.
Red.es. (2019d). *BIOTIP - Smart Tourism de Bilbao. Informative Dossier. Bilbao City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*
Red.es. (2019e). *Calviá Destino Turístico Inteligente. Informative Dossier. Calviá City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*
Red.es. (2019f). *Conil Ciudad del Mar e Inteligente. Informative Dossier. Conil de la Frontera City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20CONIL.pdf.

Red.es. (2019 g). *Connecta Valencia. Territorio Turístico Inteligente y Sostenible. Informative Dossier. Valencia Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.* https://www.red.es/redes/sites/redes/files/Descarga_Connecta_Valencia.pdf.

Red.es. (2019 h). *Destinos Turísticos Inteligentes | Red.es*. https://www.red.es/redes/es/que-hacemos/territorios-inteligentes/destinos-tur%C3%ADsticos-inteligentes.

Red.es. (2019i). *Hay un Ourense para ti. Descúbrelo. Informative Dossier. Ourense Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20OURENSE.pdf.

Red.es. (2019j). *Ibiza, Turismo Inteligente y Sostenible. Informative Dossier. Ibiza Island Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20SALOU.pdf.

Red.es. (2019k). *Lloret, Destino Inteligente. Informative Dossier. Lloret de Mar City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20LLORET%20DE%20MAR.pdf.

Red.es. (2019l). *Maspalomas Smart Destination. Informative Dossier. San Bartolomé de Tirajana City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20MASPALOMAS_0.pdf.

Red.es. (2019 m). *Níjar Smart Cabo de Gata. Informative Dossier. Níjar City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Dossier%20Iniciativa%20NIJAR.pdf.

Red.es. (2019n). *Objetos Internos de Ciudad | Red.es*. https://www.red.es/redes/es/que-hacemos/territorios-inteligentes/objetos-internos-de-ciudad.

Red.es. (2019p). *Provincia de Badajoz. Destino Turístico Inteligente. Informative Dossier. Badajoz Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20BADAJOZ.pdf.

Red.es. (2019q). *Puerto de la Cruz: Destino Turístico Inteligente. Informative Dossier. Puerto de la Cruz City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20PUERTO%20DE%20LA%20CRUZ.pdf.

Red.es. (2019r). *Red Digital de Servicios de Información y Comunicación Municipal. Informative Dossier. Almuñecar City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20ALMU%C3%91ECAR.pdf.

Red.es. (2019s). *Roquetas de sMart. Informative Dossier. Roquetas de Mar City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20Roquetas%20de%20Mar.pdf.

Red.es. (2019t). *Salou Smart Turistic. Informative Dossier. Salou City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20SALOU.pdf.

Red.es. (2019 u). *Sanxenxo y O Grove: Polos Turísticos Inteligentes. Informative Dossier. Commonwealth of Do Salnes. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*

Red.es. (2019v). *Servicio de desarrollo de la iniciativa El Hierro en Red. Expediente: 089/18-SP. El Hierro Island Council. Red.es. Convocation of Smart Islands. Smart Cities National Plan. Spanish Government.*https://contrataciondelestado.es/wps/wcm/connect/915d9e52-350f-46b0-84a3-14f9a350cd18/DOC_CD2019-054436.pdf?MOD=AJPERES.

Red.es. (2019 w). *Servicio de desarrollo de la iniciativa Fuerteventura Open i-Sland. Expediente: 001/19-SP. Fuerteventura Island Council. Red.es. Smart Cities National Plan. Spanish Government*. https://contrataciondelestado.es/wps/portal/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfljU1JTC3Iy87KtUlJLEnNyUuNzMpMzSxKTgQr0w_Wj9KMyU1zLcvQjoyyyTL2yXU3ztV3ygvNDIoyrVA3Myx1tbfULcnMdAe2cME0!/.

Red.es. (2019x). *Sistema de Inteligencia Turística de la Diputación de Cádiz. Informative Dossier. Cádiz Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20C%C3%81DIZ.pdf.

Red.es. (2019y). *Smart Costa Blanca. Informative Dossier. Alicante Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20ALICANTE_0.pdf.

Red.es. (2019z). *Smart Destination Plasencia. Informative Dossier. Plasencia City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/es/que-hacemos/territorios-inteligentes/destinos-tur%C3%ADsticos-inteligentes/beneficiarios/plasencia.

Red.es. (2020). *Objetos Internos de Ciudad | Red.es. Smart Territories National Plan. Smart Building Convocation. Spanish Government.*https://www.red.es/redes/es/que-hacemos/territorios-inteligentes/objetos-internos-de-ciudad.

Reh, W., Fellermann,.A., & Duprez,.L. (2013). *Soot-free cities: A European City Ranking, Brussels*. http://www.sootfreecities.eu/sootfreecities.eu/public/download/city-ranking-background.pdf.

Res.es. (2019). *Huesca, Turismo Inteligente e Innovación. Informative Dossier. Huesca Provincial Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government*. https://www.red.es/redes/sites/redes/files/Descarga%20Iniciativa%20HUESCA.pdf.

Ricart, J.E., .Berrone, P., Duch, A., & Carrasco-Farré, C. (2018). *IESE Cities in Motion Index 2018 | Cities in Motion*. https://media.iese.edu/research/pdfs/ST-0471-E.pdf.

Ricart, J.E., .Berrone, P., Duch, A., & Carrasco-Farré, C. (2019). *IESE Cities in Motion Index 2019 | Cities in Motion*. https://blog.iese.edu/cities-challenges-and-management/2019/05/10/iese-cities-in-motion-index-2019/.

Ricart, J.E., .Berrone, P., Duch, A., & Carrasco-Farré, C. (2020). IESE Cities in Motion Index 2019 | Cities in Motion. https://blog.iese.edu/cities-challenges-and-management/2020/10/27/iese-cities-in-motion-index-2020/.

Roblek, V. (2019). 5—The smart city of Vienna. In L. Anthopoulos (Ed.), *Smart city emergence* (pp. 105–127). Elsevier. https://doi.org/10.1016/B978-0-12-816169-2.00005-5.

Rºd.es. (2019o). *Ourense: Capital Termal Inteligente. Informative Dossier. Ourense City Council. Red.es. Smart Territories National Plan. Convocation of Smart Tourist Destinations. Spanish Government.*

Rosenzweig, C., Solecki, W. D., Hammer, S. A., & Mehrotra, S. (2011). *Climate change and cities: First assessment report of the urban climate change research network*. Cambridge University Press.

Ruhlandt, R. W. S. (2018). The governance of smart cities: A systematic literature review. *Cities (London, England), 81*, 1–23. https://doi.org/10.1016/j.cities.2018.02.014

SCEWC. (2012). *Smart City Expo World Congress*. http://www.smartcityexpo.com/en/the-event/past-editions-2012.

SEPG. (2014). *Programa Operativo FEDER Plurirregional de España (POPE) 2014-2020. CCI: 2014ES16RFOP002.*http://www.dgfc.sepg.hacienda.gob.es/sitios/dgfc/es-ES/ipr/fcp1420/p/Prog_Op_Plurirregionales/Documents/PO_Plurirregional_de_Espa%C3%B1a_Decision.pdf.

Shapiro, J. M. (2006). Smart cities: Quality of life, productivity, and the growth effects of human capital. *The Review of Economics and Statistics, 88*(2), 324–335. https://doi.org/10.1162/rest.88.2.324

Shen, L.-. Y., Jorge Ochoa, J., Shah, M. N., & Zhang, X. (2011). The application of urban sustainability indicators – A comparison between various practices. *Habitat International, 35*(1), 17–29. https://doi.org/10.1016/j.habitatint.2010.03.006

Shin, Y., & Shin, D.-. H. (2012). Community informatics and the New Urbanism: Incorporating information and communication technologies into planning integrated urban communities. *Journal of Urban Technology, 19*(1), 23–42. https://doi.org/10.1080/10630732.2012.626698

Shmelev, S. E., & Shmeleva, I. A. (2019). Multidimensional sustainability benchmarking for smart megacities. *Cities (London, England), 92*, 134–163. https://doi.org/10.1016/j.cities.2019.03.015

Siemens. (2017). *European green city index. Assessing the environmental impact of Europe's major cities (Miscellaneous) | ETDEWEB*. https://www.osti.gov/etdeweb/biblio/21274792.

Silva, B.N., .Khan, M., & Han, K. (2018). Towards sustainable smart cities: A review of trends, architectures, components, and open challenges in smart cities. *Sustainable Cities and Society*, 38, 697–713. https://doi.org/10.1016/j.scs.2018.01.053.

smartcity.Press. (2017). *What makes London one of the smartest cities in the world*. October 27. Smartcity.Press https://www.smartcity.press/londons-smart-city-initiatives/.

Su, K., Li, J., & Fu, H. (2011). Smart city and the applications. In *2011 international conference on electronics, communications and control (ICECC)* (pp. 1028–1031). https://doi.org/10.1109/ICECC.2011.6066743

Telefónica, F. (2011). *Smart cities: Un primer paso hacia la internet de las cosas*. Fundación Telefónica.

Thite, M. (2011). Smart cities: Implications of urban planning for human resource development. *Human Resource Development International, 14*(5), 623–631. https://doi.org/10.1080/13678868.2011.618349

UN. (2015). *World urbanization prospects: The 2014 revision.*https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf.

UN. (2018). *World urbanization prospects—Population division—United nations*. https://population.un.org/wup/.

UNE. (2016a). *Comité ctn 178 ciudades inteligentes*. https://www.une.org/Paginas/Normalizacion/Ficha-CTN.aspx?n=1&c=CTN%20178.

UNE. (2016b). *Norma une 178104:2017-Comprehensive systems for a smart city management. requirements of interoperability for a smart city platform*. https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma?c=N0059471.

UNE. (2016c). *UNE 178201: Ciudades inteligentes. definición, atributos y requisitos.*.

UNEP. (2013). *City-Level decoupling: Urban resource flows and the governance of infrastructure transitions.*http://www.unep.org/resourcepanel/portals/24102/pdfs/cities-full_report.pdf.

Valencia City Council. (2017). Documentación administrativa, artículos, ponencias y vídeos. *València Ciudad Inteligente*. http://smartcity.valencia.es/recursos/.

La Vanguardia. (2015). `Smart cities': Creando las ciudades del futuro. La Vanguardia. https://www.lavanguardia.com/tecnologia/innovacion/20151124/30365276282/smart-cities-ciudades-inteligentes-barcelona.html.

La Vanguardia. (2016, October 3). Barcelona recibe 15 millones de fondos europeos para los barrios del Besòs. La Vanguardia. https://www.lavanguardia.com/politica/20161003/41758557068/barcelona-recibe-15-millones-de-fondos-europeos-para-los-barrios-del-besos.html.

Velert, S. (2018). Viena es la ciudad más habitable del mundo. *El País*. https://elpais.com/internacional/2018/08/14/actualidad/1534245984_920708.html.

Villarejo-Galende, H. (2015). Smart cities: Una apuesta de la Unión Europea para mejorar los servicios públicos urbanos. *Revista de estudios europeos, 66*, 25–51.

Vitunskaite, M., He, Y., Brandstetter, T., & Janicke, H. (2019). Smart cities and cyber security: Are we there yet? A comparative study on the role of standards, third party risk management and security ownership. *Computers & Security, 83*, 313–331. https://doi.org/10.1016/j.cose.2019.02.009

Vivas, C. (2014). *ECKM2014-Proceedings of the 15th European conference on Knowledge Management: ECKM2014*. Academic Conferences and Publishing International.

Wei, Y., Huang, C., Li, J., & Xie, L. (2016). An evaluation model for urban carrying capacity: A case study of China's mega-cities. *Habitat International, 53*, 87–96. https://doi.org/10.1016/j.habitatint.2015.10.025

Wright, M., Siegel, D. S., & Mustar, P. (2017). An emerging ecosystem for student start-ups. *The Journal of Technology Transfer, 42*(4), 909–922. https://doi.org/10.1007/s10961-017-9558-z

Wu, Z. (2018). *Intelligent city evaluation system.* Springer.

WWF (2012). Living Planet. Report 2012. Biodiversity, biocapacity and better choices. https://d2ouvy59p0dg6k.cloudfront.net/downloads/2_lpr_2012_online_single_pages_version2_final_120516.pdf.

Zelt, T., Ibel, J., & Tuncer, F. (2017). THINK ACT: Smart city, smart strategy. *Roland Berger GmbH*. https://www.rolandberger.com/publications/publication_pdf/ta_17_008_smart_cities_online.pdf.

Zvolska, L., Lehner, M., Palgan, Y. V., Mont, O., & Plepys, A. (2019). Urban sharing in smart cities: The cases of Berlin and London. *Local Environment, 24*(7), 628–645. https://doi.org/10.1080/13549839.2018.1463978

Zygiaris, S. (2013). Smart city reference model: Assisting planners to conceptualize the building of smart city innovation ecosystems. *Journal of the Knowledge Economy, 4*(2), 217–231. https://doi.org/10.1007/s13132-012-0089-4