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Master Program in Information Management

The Maturity of Smart Cities in Portugal

*A study about the urban growth of Portuguese municipalities
on becoming truly smart and sustainable cities.*

Débora Coelho de Carvalho Montalvão

Proposal presented as partial requirement for the degree of
master's in information management, Specialization in
Marketing Intelligence

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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THE MATURITY OF SMART CITIES IN PORTUGAL

by

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Proposal presented as partial requirement for obtaining the master's degree in Information Management, with a specialization in Marketing Intelligence

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DEDICATION

To my beloved grandparents Celeste Coelho de Souza Oliveira, Hélio Silveira da Rosa, Maria Aparecida Carvalho Montalvão, Cylea Coelho Silveira da Rosa, Jorge Vasconcellos Montalvão, Olga Bianco and José Bianco Sobrinho for their faith in my journey and for the incessant investment in my education since childhood.

To my Portuguese godfathers Joana Aquino Fernandes de Souza e Felipe Carvalho Coelho, for their help, patience and love since my first steps in Portugal.

To Prof. PhD Miguel de Castro Neto for the opportunity to work with him, for helping me discover my passion for Smart Cities and for inspiring me to learn since the day I first entered his Sustainable Cities class.

ABSTRACT

On November 1st 1755, a violent earthquake hit the Portuguese coast. (Sarmiento & Cardoso, 2006). Sebastião José de Carvalho e Melo, 1st Marquis of Pombal, as Chief minister of King Joseph I, was responsible for understanding the reasons for the earthquake and for rebuilding what was destroyed. On 1756, he sent a scientific inquiry to all catholic congregations in Portugal, collecting data about the intensity and damage caused by the earthquake in all national territory. The results were published in the newspapers at the time. (Midões, 2009)

The Lisbon Earthquake, as it is known, constitutes today a historical and scientific landmark, as it marked a turning point in national architecture and spatial planning. The survey carried out by the Marquis of Pombal, was the beginning of the study of seismology and served as an object of study for modern science. (Midões, 2009)

KEYWORDS

Smart Cities, Smart City, Urban Analytics, Sustainable Cities, Urban Intelligence, Digital Transformation for Cities, Urban Technology, Internet of Things for Smart Cities, Urban Development

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LIST OF ABBREVIATIONS AND ACRONYMS

ANMP	The ANMP – Associação Nacional dos Municípios Portugueses, translated from Portuguese as National Association of Portuguese Municipalities
PSCS	The PSCS is the abbreviation for Portugal Smart City Summit
NOVA IMS	The NOVA IMS – is the Information Management School of NOVA University
NOVA Cidade	NOVA Cidade - Urban Analytics LAB, the laboratory is a network of people and organizations, promoted by NOVA IMS
SC	Smart Cities
PB	Participatory Budgeting
IoT	Internet of Things
ICT	Information and communication technologies

1. INTRODUCTION

1.1. WHAT IS A SMART CITY?

In the 1950s, according to the Department of Economic and Social Affairs of the United Nations, around 30% of the world population resided in urban areas. The expectation of growth was so high, that in 2014 the percentage increased to 55%. The estimate is that it'll get to 68% by 2050 (Sánchez-Corcuera et al, 2019). Consequently, cities' services and infrastructures are being stretched to their limits in terms of scalability, environment, and security as they adapt to support this population growth. (Khatoun & Zeadally, 2016).

For much of the 20th century, the idea that a city could be smart was a scientific fiction that was pictured in the popular media, but quite suddenly, with the massive proliferation of computable devices across many scales and with a modicum of intelligence being embedded into such devices, the prospect that a city might become smart, sentient even, is fast becoming the new reality (Batty, et al., 2012).

Smart cities projects addresses many application areas within fields like communication, culture, energy, environment/climate, health, tourism, and transport. "Smart cities" is closely related to "smart buildings" and "smart devices" but neither cities, buildings nor devices are smart by themselves. The whole concept relies on the smartness of the city administration, politicians and the citizens to utilize technology in "smart" ways. Definitions often include administrative aspects like good governance and city management, where citizen participation plays an important role. One popular definition is: "Projects of smart cities have an impact on the quality of life of citizens and aims to foster more informed, educated, and participatory citizens. Additionally, smart cities initiatives allow members of the city to participate in the governance and management of the city and become active users" (Chourabi et al., 2012).

The "smart city" is an umbrella for cities that use information technology to improve services and provide better quality of life for its citizens. (Berntzen, 2016). A smart city transforms the city in a platform and understands how digital networks are changing urban life and governance. (Bollier, 2016). Cities can now use four asset classes or tools—people, data, infrastructure and technologies—which can each interact in more fluid, synergistic ways than before. (Bollier, 2016)

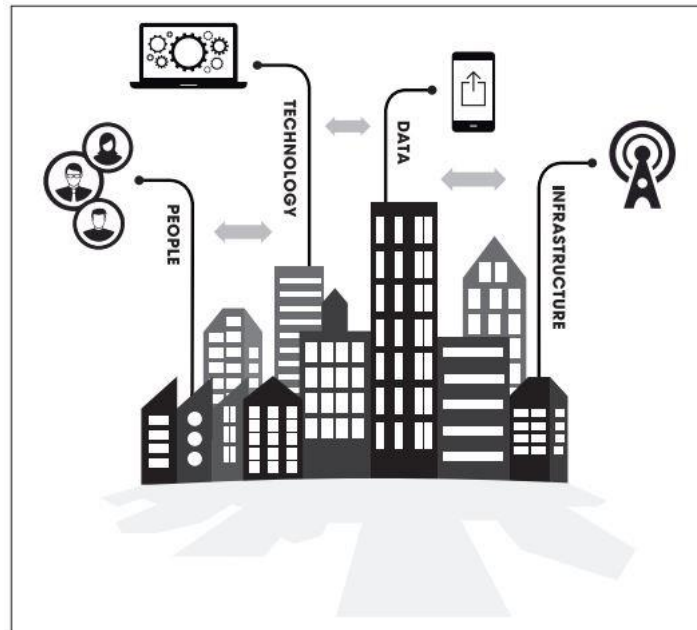


Figure 1 - Cities can now use four asset classes or tools—people, data, infrastructure and technologies—which can each interact in more fluid, synergistic ways than before (Bollier, 2016)

Adding intelligence to complex environments that have evolved organically over many years has proven challenging—and managing to use that intelligence to effect meaningful change in the quality of life is even harder (Woetzel, 2018).

By leveraging advanced power systems, networking, and communication technologies, a smart city aims to enhance the lives of its citizens and optimize territorial, economic, and environmental resources (Khatoun & Zeadally, 2016). Most smart cities models consist of six components: government, economy, mobility, environment, living, and people (Khatoun & Zeadally, 2016).

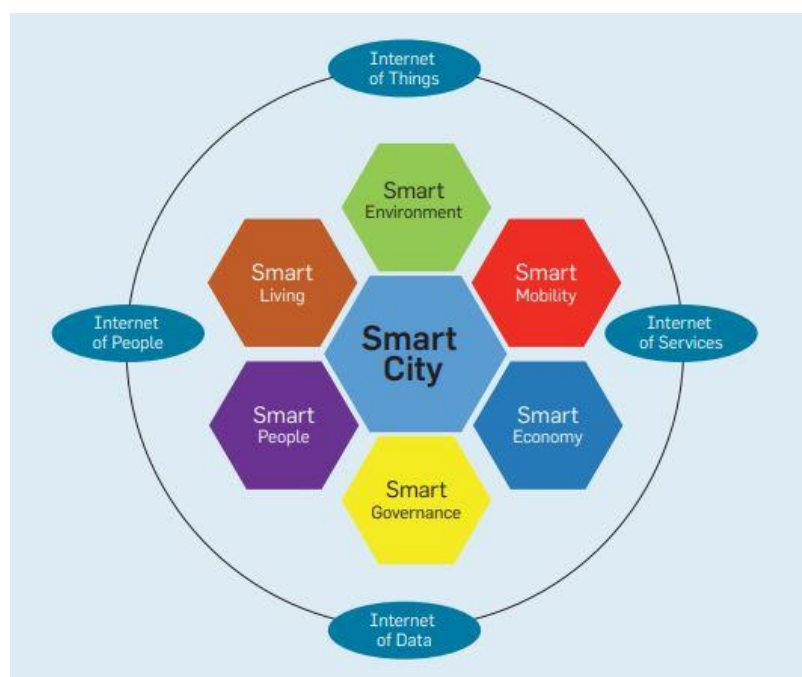


Figure 2 - A Smart City Model (Khatoun & Zeadally, 2016)

Smart cities are indeed envisioned to play a crucial role in providing an efficient and sustainable model for urban areas while mitigating climate and environmental issues (Carli et al, 2017). Smart cities put data and digital technology to work with the goal of improving the quality of life. More comprehensive, real-time data gives agencies the ability to watch events as they unfold, understand how demand patterns are changing, and respond with faster and lower cost solutions (McKinsey Global Institute, 2018).

The conceiving of cities as platforms represents a significant shift in how cities might function. An open platform honors self-organized, bottom-up participation in the style of open source software, for example. It regards rigid and complex sets of rules and non-transparency as irksome impediments (Bollier, 2016).

1.2. BACKGROUND AND PROBLEM IDENTIFICATION

The first steps into smart cities in Portugal are already taken. The initiatives on Smart Cities in Portugal were formalized on February 23rd of 2016, when the government initiated the Smart Cities Section at the National Association of Portuguese Municipalities. (ANMP, 2016)

Since then, through the section, those municipalities have more representativeness within the government to bring investment and improvement on behalf of urban intelligence.

The National Association of Portuguese Municipalities has 308 municipalities in total. In February of 2016, the Section of Smart Cities was founded in Portugal with 136 municipalities subscriptions to the initiative.

Before that, several Portuguese municipalities already had Smart Cities projects implemented or at least mapped, but there wasn't a former classification for those next to the government. The Smart Cities Section foundation was an important step to join efforts between municipalities and progressing Smart Cities topics inside Portugal.



Figure 3 - ANMP Logo

During the past years, the Portuguese Smart Cities Section and the municipalities have accomplished great achievements all over the country. This study was born because of the necessity to map the projects and responsible teams that are improving Portugal as a smart country as well.

Regarding the Smart Cities section itself, the municipalities mayors are known as the main person responsible, but there was not an accurate formal list of names, contacts and qualifications of the people responsible for smart cities in these 136 municipalities or their projects details.

This study is based on the research of Smart Cities in Portugal, done for the panel "State of Art of Smart Cities in Portugal", presented by Professor PhD Miguel de Castro Neto at Portugal Smart Cities Summit 2019, that occurred on May 21st 2019, in Lisbon, Portugal.

1.3. OBJECTIVES OF THE STUDY

The primary objective of this study was to collect data on Portugal's municipalities that belong to the Smart Cities Section of the National Association of Portuguese Municipalities; and start listing who are the technical professionals and politicians responsible for smart cities projects all over the country. Collecting & organizing data from the actual initiatives in Portugal is another step in improving the existence of projects and motivates more municipalities in joining the Smart Cities official section in the future.

The secondary objective of this research was to enrich the data of the panel "State of Art of Smart Cities in Portugal", presented by Professor PhD Miguel de Castro Neto at Portugal Smart Cities Summit 2019, that occurred in May 21st, 2019 in Lisbon. The presentation was broadcasted live on the NOVA CIDADE LAB's Facebook page.



Figure 4 – Portugal Smart Cities Summit 2019 publicity

The Portugal Smart Cities Summit is the main event that brings innovation and promotes the interchange of experiences in Urban Intelligence in the Portuguese field. Regarding Smart Cities initiatives, the Portugal Smart Cities Summit is one of the most important annual events that brings acknowledgement and innovation on the field. This research presented in the 2019 Portugal Smart Cities Summit focused on capturing the current know-how of municipalities in improving the lives of their citizens through the implementation of smart cities initiatives.

1.4. STUDY RELEVANCE AND IMPORTANCE

There are three perspectives of this study. The first one is that the data & contacts collected helped enrich the work of NOVA CIDADE – Urban Analytics LAB, promoted by NOVA IMS, in building a Smart Cities network; the second is about the national relevance of a research that catalogues & consolidates Portuguese initiatives; and the third is to increase Portugal's relevance in the SC field, as seen from a worldwide point of view.

This is the first study that created a Smart City graded classification and a survey to question the Portuguese Smart Cities Section municipalities. The results were relevant to Prof. Miguel de Castro Neto, who was able to create accurate graphs and present them on the panel "State of Art of Smart Cities in Portugal" at the 2019 Portugal Smart Cities Summit.

From a national point of view, Portugal has 308 municipalities in total, but only 136 belongs to the Smart Cities Section. (ANMP, 2016) For further years, the importance of this study is to increase this number until it reaches the entire country. By showing the advantages that smart cities initiatives can bring to the wellbeing of citizens, other municipalities interests in the investment of urban intelligence will grow and it'll receive more attention from the government. The full list for the municipalities members of the Smart Cities Section is on the Annexe 1 of this study.

While mentioning the global relevance, a study from Vienna University of Technology for medium & large-sized cities has compared two cities in Portugal: Lisbon and Coimbra. Lisbon is in the category of large sized city and Coimbra in small/medium sized category. The six classifications used are: smart economy, smart people, smart governance, smart mobility, smart environment, and smart living. (Giffinger, et. al., 2015)

All the graphics needed to have at least three cities mandatory and a fourth line to show the average of all cities, so that it will only be mentioned the comparison between the average city and the Portuguese one.

Comparing Lisbon to the average of all cities, the only touchpoints between them are on smart governance and smart environment, on all the other topics Lisbon is far behind.

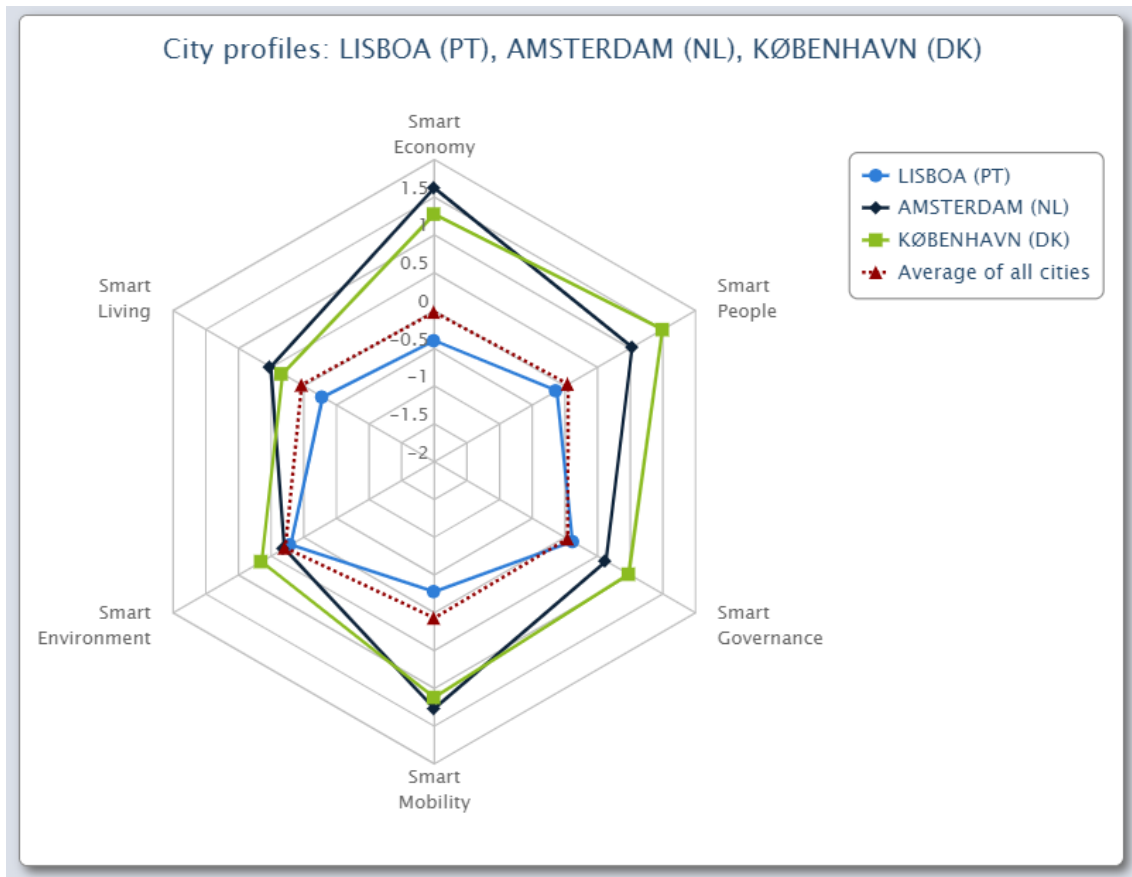


Figure 5 - Larger European cities: Cities from 300 000 to 1 million inhabitants

Coimbra belongs to the European medium-sized cities category and all classifications are equal. Over this graph, Coimbra beat the average of all cities only regarding smart governance, smart environment, and smart living.

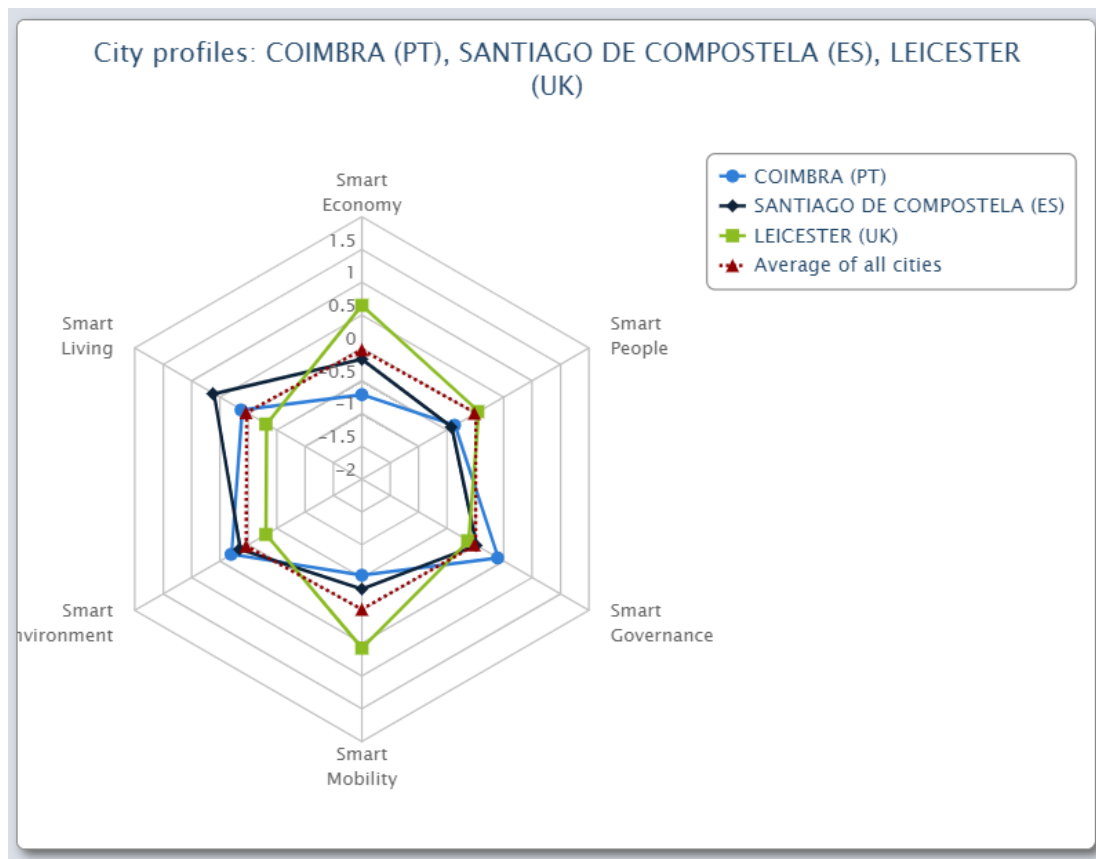


Figure 6 - European medium-sized cities: Cities from 100 000 to 500 000 inhabitants

This study is a way to present academically a small contribution in building network and knowledge exchange between the whole country and beyond. All the efforts that already exist and the ones being planned will turn Portugal into a smart country. The impressive results will be presented in the next pages.

2. LITERATURE REVIEW – SMART CITIES CLASSIFICATIONS FOR THIS STUDY

How to identify a Smart City? Some characteristics need to be easily recognized in order for a city to be known as an SC. A Smart City is a city well performing in a forward-looking way in these six characteristics that are built on the 'smart' combination of endowments and activities of self-decisive, independent, and citizens awareness (Vienna University of Technology, 2007). The study made by the Vienna University of Technology, combined 33 topics to build six main characteristics to measure a Smart City. Focused on medium sized cities (inhabitants amount metric) and with access to relevant databases, Vienna's objective was to rank cities by grading each characteristic. Factors and characteristics are described below.

SMART ECONOMY (Competitiveness) ▪ Innovative spirit ▪ Entrepreneurship ▪ Economic image & trademarks ▪ Productivity ▪ Flexibility of labour market ▪ International embeddedness ▪ <i>Ability to transform</i>	SMART PEOPLE (Social and Human Capital) ▪ Level of qualification ▪ Affinity to life long learning ▪ Social and ethnic plurality ▪ Flexibility ▪ Creativity ▪ Cosmopolitanism/Open-mindedness ▪ Participation in public life
SMART GOVERNANCE (Participation) ▪ Participation in decision-making ▪ Public and social services ▪ Transparent governance ▪ <i>Political strategies & perspectives</i>	SMART MOBILITY (Transport and ICT) ▪ Local accessibility ▪ (Inter-)national accessibility ▪ Availability of ICT-infrastructure ▪ Sustainable, innovative and safe transport systems
SMART ENVIRONMENT (Natural resources) ▪ Attractivity of natural conditions ▪ Pollution ▪ Environmental protection ▪ Sustainable resource management	SMART LIVING (Quality of life) ▪ Cultural facilities ▪ Health conditions ▪ Individual safety ▪ Housing quality ▪ Education facilities ▪ Touristic attractiveness ▪ Social cohesion

Figure 7 - Characteristics used on Vienna study (Vienna University of Technology, 2007)

"Smart Economy" includes factors all around the economic competitiveness such as innovation, entrepreneurship, trademarks, productivity and flexibility of the labour market as well as the integration in the (inter-)national market. "Smart People" is not only described by the level of qualification or education of the citizens but also by the quality of social interactions regarding integration and public life and the openness towards the "outer" world. "Smart Governance" comprises aspects of political participation, services for citizens as well as the functioning of the administration. Local and international accessibility are important aspects of "Smart Mobility" as well as the availability of information and communication technologies and modern and sustainable

transport systems. “Smart Environment” is described by the appealing natural conditions (climate, green space etc.), pollution, resource management and also by efforts towards environmental protection. Finally, “Smart Living” comprises various aspects of quality of life such as culture, health, safety, housing, tourism, etc (Vienna University of Technology, 2007).

For this study, along with Prof. Neto’s, who has extensive knowledge on SC in Portugal, were selected nine main topics that would be relevant data to gather. From each topic, the survey of this study questioned the person responsible for the municipalities about detailed information. All these topics were fundamental in answering the main question on this study: what is the maturity of the smart cities in Portugal?



Figure 8 – The nine smart cities classifications of this study

The nine classifications are: public wi-fi, participatory budget, smart management of solid waste, smart public lighting, smart parking systems, fix my street, smart management of green spaces, smart tourism app and urban intelligence platform.

Each classification will be detailed one by one, using examples of projects that already exists in the Portuguese municipalities. The already implemented initiatives presented were known by Prof. Neto or collected from the survey results of this study.

2.1. PUBLIC WI-FI

Free Internet Access is the first topic of this survey. Enabling communication technologies and providing network connectivity are essentials to have as internet access is an important tool for a Smart City (Yaqoob et al, 2017). Scalable wireless solutions crossing with amounts of data generated are the key to the emerge of the Internet of Things (IoT).

Urban development

Internet of things > data generated > everything connected through internet > controlling the city using the data > citizens, tourist, governments and companies using the resources through wifi

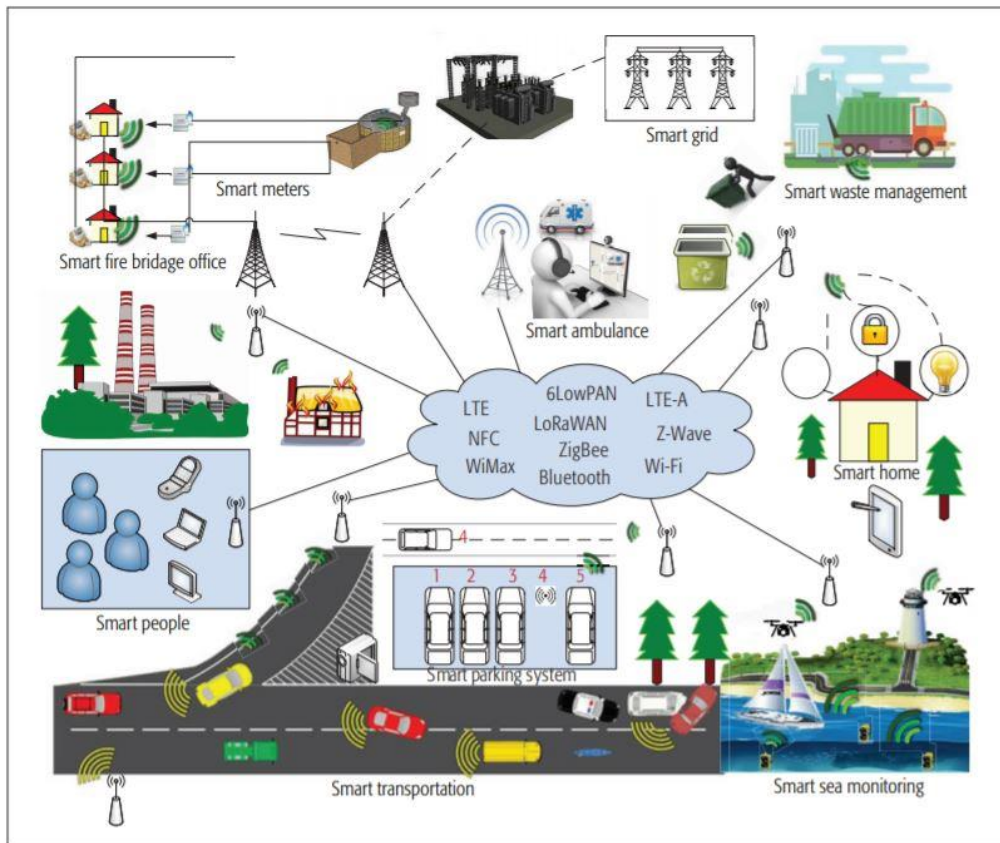


Figure 9 - Enabling communication technologies for smart cities (Yaqoob et al, 2017)

The project Coimbra+ is the Smart City initiative of the Coimbra Municipality. Known to have some of the most important universities in the country, the population of Coimbra have a high percentage of students. To reinforce the position as a “Smart City”, Coimbra Municipality is providing free internet access on several city spots, allowing everyone to connect to all the digital services of the municipality (Câmara Municipal de Coimbra, 2020).



Figure 10 - Free Wi-Fi, Coimbra+ Project (Câmara Municipal de Coimbra, 2020)

At Coimbra Municipality this service is already implemented, and the initiative counts with 244 free wi-fi hotspots that provide internet 24 hours, 94 fixed and 150 non-fixed devices. The secondary objectives of the municipality are to promote the tourism, culture, retail and all economic activity in general, also providing internet access with ease to all citizens (Câmara Municipal de Coimbra, 2020).

2.2. PARTICIPATORY BUDGETING

The topic number four of the survey mentions Participatory Budgeting. PB is an innovative democratic practice that consists of giving citizens in a local community the power to vote and identify spending priorities (Stortone, 2015). Created in 1989 in Porto Alegre (Brazil), the initiative was implemented to fight against corruption in the city administrations (Scherer, 2012). Through this kind of participation, the citizens are regularly voting for the city projects they prefer and influence the priorities of the government expenses. The purpose of citizen participation on politics through Participatory budgeting are, first, the manifestation of democracy by the citizens (Bernzten et. al, 2016), and secondly to bring attention for policymaking from the community at urban level (Stortone, 2015).

Not commonly, Smart Cities initiatives are first related to public administrative decisions. It's important to include aspects like governance and city management under the umbrella of information and communication technology, allowing cities to work on a smart democratic way, as well (Bernzten et. al, 2016). How PB helps a community to be a Smart City on the 21st century? Many communities brought PB as a platform to the internet, evolving the initiative to an electronic participation, spreading the information on an open data level and making the internet as a tool to a more civic usage.

In Portugal the usage of Participatory Budgeting is not recent. For example, the city of Lisbon had the first round of PO in 2008 (Câmara Municipal de Lisboa, 2020). The image below is a screenshot of Lisbon municipality's PB platform.



Figure 11 - Lisbon Participatory Budgeting Website (Câmara Municipal de Lisboa, 2020)

Once a year, the Lisbon citizens are asked to submit proposals and, therefore, vote on the initiatives they think have more value added to the community. From 2008 to 2018, as mentioned at the

website, the municipality has already received 6743 proposals from the citizens and has invested around 36 million euros on 139 winning projects, and has select which projects are worth financing and implementing. All those submissions and voting occurs within the platform. The main reason it can be considered a successful project is that the annual budgeting assigned to PB keeps growing year by year (Câmara Municipal de Lisboa, 2020).

2.3. SMART MANAGEMENT OF SOLID WASTE

Solid waste management is one of the most important challenges in urban areas throughout the world and it is becoming a critical issue in developing countries where rapid increase in population has been noticed. Waste collection is a complex process that requires the use of a large amount of money and an elaborate management of logistics. (Catania & Ventura, 2014) From its conception to its disposal, waste management is one important challenge for the municipal corporations all over the world. A wireless solid waste management system for smart cities allows municipal corporations to monitor status of dustbins remotely over web server and keeps cities clean very efficiently by optimizing cost and time required for it. Waste management departments get alerts from the module that monitors if the dustbin is reaching its maximum level and the waste collector vehicle can be sent to the location. The objective is to enhance practicality of IoT based solid waste collection and management for smart city. (Bharadwaj, 2016)

The project from Cascais named “Cascais Ambiente” has the Smart Waste Management already implemented. The four milestones of the initiative are: technology, operational set up, high qualified team and interaction with the citizens.

The solution consists on an automated solution that monitors volume sensors inside the underground waste containers. The sensors report the fulfillment of the containers and easily provide the route of all trucks to collect on a computed and efficient way. The citizens can also notify via app any inconvenience that needs public waste management attention, such as fallen trees or large dimensions waste out of the containers. (Smart Waste Management Cascais, 2017)



Figure 12 - Benefits of Smart Waste Management in Cascais, Ambiente Project (Canal Cascais, 2017)

The solution brought efficiency to the collector trucks that decreased their routes under 180.000 kms and saved 600.000 euros yearly to the municipality.

2.4. SMART PUBLIC LIGHTING

The question number six of the survey was about Smart Public Lighting, that is an electricity consumption management focused on saving public resources and understanding the usage necessities of the community. Public lighting accounts for 19% of all electrical consumption of an entire city, with this knowledge, being able to manage new solutions as adaptive and interoperable lighting, would save large amounts of money. Additional savings can be achieved by incorporating connected controls to the Internet (Crowther et. al,2012).

The main improvements that the installation of an internet connected smart lighting system can bring to urban locations are to convert from conventional lighting to a more economical solution as LED lighting, being able to manage remotely the levels of light & consumption, being able to verify in real time the installations and technical issues, data collection & history storage, detailed info of each lamp status, the possibility to plan for each urban spot (Município de Braga,2019). “In particular, energy consumption for urban street lighting has assumed considerable importance in the energy and economic balance for many cities, as demonstrated by the increasing commitment of city authorities in energy efficiency and green energy for public lighting systems.” (Radulovic et al., 2011).

The benefits of the migration from traditional lighting operations to intelligent lighting operations are not just directly related to saving public money. The usage of smart lighting systems also improves the remote monitoring, having automatic reports in real time, smart asset management, saving workforce time, smart dimming & scene setting, improving quality of life and safety and intelligent energy metering & billing and, also, helps to accurate lighting charges (Crowther et. al, 2012). “Artificial light is an essential element of urban environments—not only after dark, but also as part of a city’s identity. It affects residents’ sense of safety and social inclusion, and also influences the degree to which cities can create an inviting environment for business and tourism.” (Crowther et. Al, 2012).

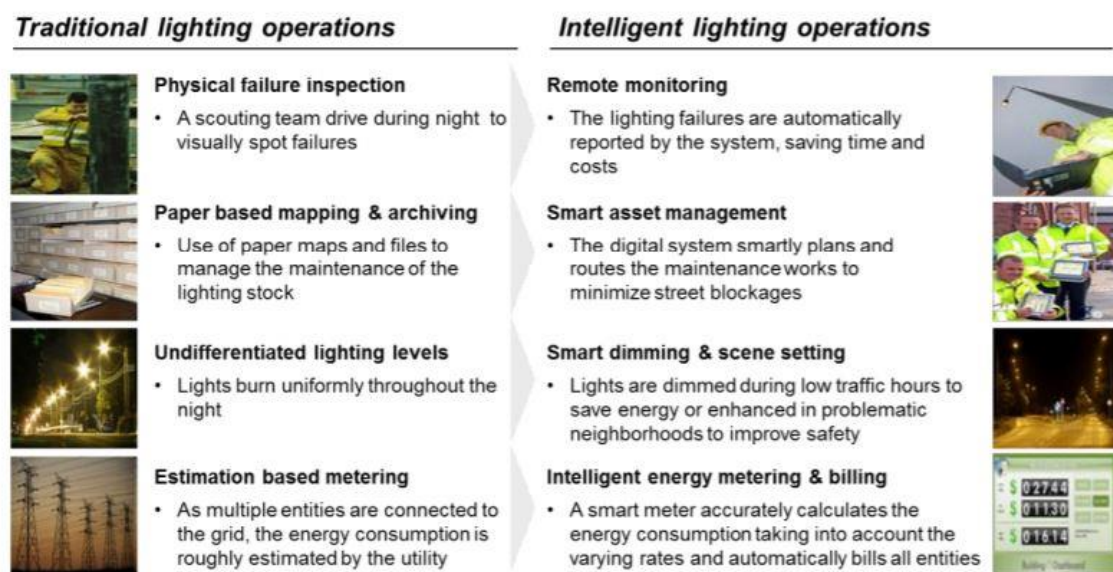


Figure 13 - Moving from “Traditional” to “Intelligent” Lighting Networks (Crowther et. al,2012)

In 2019, the municipality of Braga, started the installation of public lighting covering around 4,5 hectares of the urban perimeter. (Município de Braga, 2019) The project named BUILD – Braga Urban Innovation Laboratory, has the monitoring of the Smart Lighting as one important achievement to put Braga Municipality on the hotspot of Portugal’s “Smart City” project. Luminaires were installed and are remotely associated to a management system and can be monitored via an electronic platform. All devices have motion detector and also environmental sensors, that not only provide light for a certain time when circulation is detected, but also provides measurements of ozone and carbon levels all in one device. “The energy efficiency management in cities helps local governments to focus on important energy projects that have strong environmental aspects and financial feasibility.” (Radulovic et al, 2011). Surely the progress made in Braga Municipality will save a lot of money on public lighting expenses and will bring more investment to other important initiatives inside the Municipality.



Figure 14 - Braga Municipality Smart Lighting Installation (Município de Braga, 2019)

2.5. SMART PARKING SYSTEMS

The question number seven of this study was about Smart Parking Systems, a system that has all the public parking slots mapped and connected with a real time open data network. That is a solution for the drivers to know where to park, the availability of the parking lot, the avoidance of unnecessary traffic and for the payment to be made remotely; and also for the municipality to understand the use of public parking, get data of usage and avoid unpaid parking.

Smart parking is a typical Internet of Things (IoT) application that can benefit from advances in sensor, actuator and Radio-frequency identification (RFID) technologies to provide many services to its users and parking owners of a smart city. (Bagula, 2015). The most common sample usage of this

solution is on shopping centers parking lots where it's displayed at the entrance the number of empty slots, to allow the drivers to know which floor has more slots to park as soon as they arrive.

Smart Parking is a system that allows the driver to save time and can bring a lot of improvements to the community. (Bagual, 2015) The figure below, number 15, also draws a prototype of how a smart parking system works. Sensors are installed to map the parking slots and connect it to the wireless network, direct it to the Micro Cloud that allows a software to run the application. The drivers connected to the internet are able to access the parking network and see where the empty slots are.

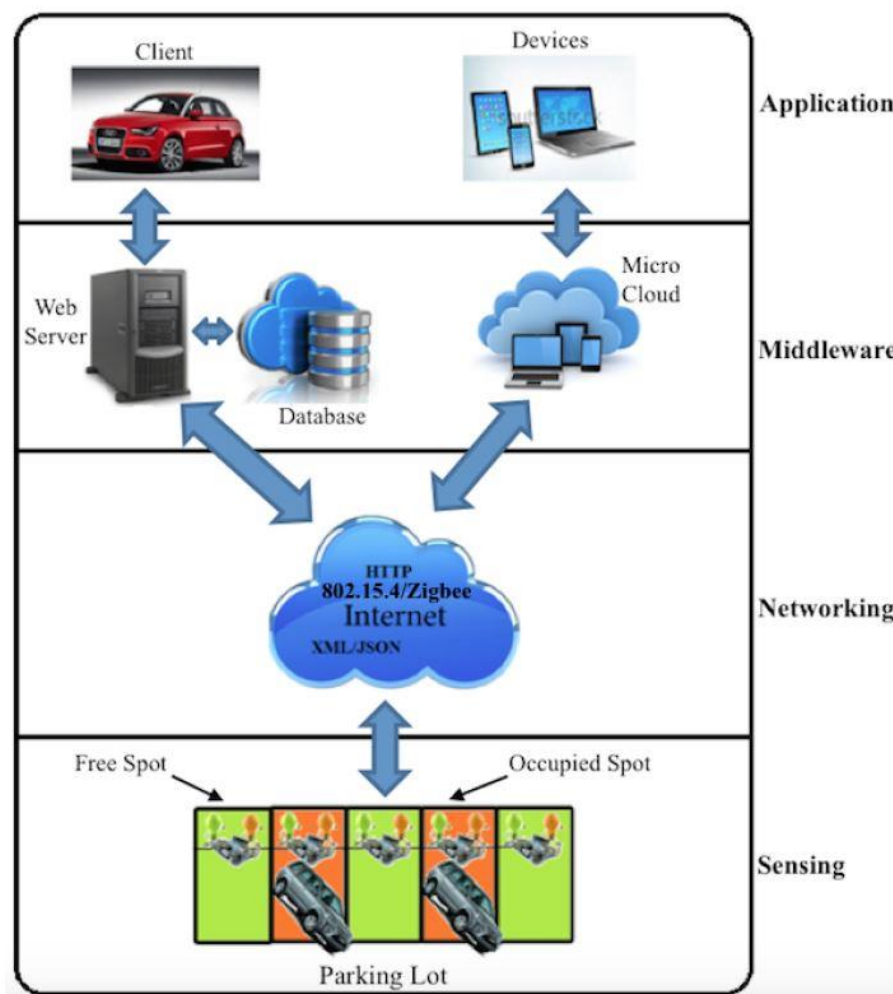


Figure 15 - The smart parking system (Bagula, 2015)

In Portugal, the municipality of Cascais already has this solution implemented and more. The MobiCascais is an integrated system of sustainable mobility management in the municipality of Cascais. The main objective of the project is to promote the public transportation usage and light mobility solutions. Using the Mobi Cascais app, the drivers see a real time map of the region with signs for the empty parking slots. The service is also available in mobile app version. The MobiCascais features offers a lot of services such as renting shared bikes & electric scooters, renting shared cars, where to find parking slots for cars & motorcycles, where to find chargers for electric cars & scooters and pay & renew payment. Since its implementation, the project allowed 210 thousand

citizens and 1,2 million tourists to have flexible solutions for sustainable and smart mobility (MobiCascais, 2020).

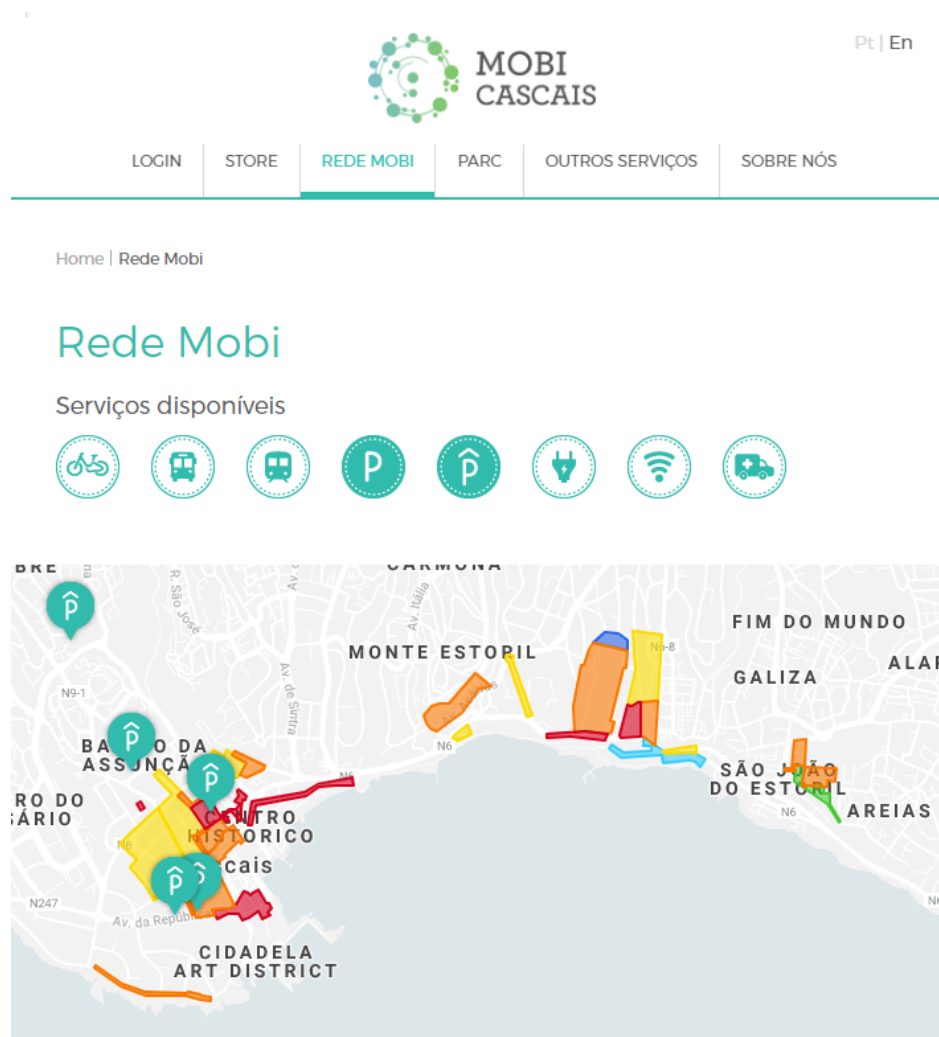


Figure 16 - Mobi Cascais Project (MobiCascais, 2020)

The image above represents a map view of Cascais Municipality, showing the different icons for each service available on the MobiCascais solution.

2.6. FIX MY STREET

FixMyStreet solutions are a web-based civic participation platform that allows inhabitants to report environmental defects like potholes and damaged pavements to the government (Pak et. al., 2017). When assigned to public service use, technology not only offers efficiency and effectiveness but also provides a vast opportunity for disseminating public information that can enable citizens to partner with, or sometimes replace, governments (Baykurt,2011). This specific service allows residents of certain cities to report a variety of issues and makes sure the complaints end up with the proper local authorities (Walravens, 2013). Thanks to free and open source software and data.gov initiatives, citizens can have access to more public information and face lower barriers to report their issues/stories as well as engaging in conversation with authorities (Baykurt,2011).

The Lisbon's Fix My Street is a portal for residents to participate in situations within the city of Lisbon that need intervention of the Lisbon City Council or Parish Councils. The portal, available as a website and for mobile devices, identifies the service responsible for the problem and allows permanent monitoring of the process, as well as others already reported by other users. (Câmara Municipal de Lisboa, 2021). Conceived as public service improvement system to promote transparency and accountability, these platforms allow citizens to work collaboratively with their governments to maintain their environments. Citizens report defects to their governments through these platforms and governments commit to respond in a timely manner. The reported defects are aggregated on a publicly accessible map that reflects the state of the environment (Pak, et. al., 2017).



Figure 17 - Lisbon Fix my Street App

The images above show the “At my street Lisbon” app and the main categories that the user needs to choose from to start a report on the app. At the portal, the user can report this main categories of issues: Animals in an urban environment, trees & green spaces, municipal equipment - culture, municipal equipment - sports, municipal equipment - education, roads & cycle paths, municipal housing, urban hygiene, public lighting, sidewalks & accessibility, sanitation and public safety & noise.

2.7. SMART MANAGEMENT OF GREEN SPACES

Plants not only constitute useful green space to contrast urban pollution effects or provide ecosystem that benefits its residents, but they can also be used as bioindicators for air pollution assessment and their involvement in communication networks can represent a significant contribution to building a smart, green city. The concept of the Internet of Things (IoT) envisages that objects that surround us will be connected and there are no reasons to exclude urban trees from among the “wired object” (Luvisi and Lorenzini, 2014). Green spaces in an urban environment are vital for improving living conditions by improving air quality and aesthetics, which eventually leads to higher real-estate values and a reduction in energy use for cooling (Liu et. al., 2020). The concept of living organisms (trees, herbaceous plants or lichens) used as watchmen for citizen wellness thanks to their connection to an urban information system is in agreement with a possible city of the future (Luvisi and Lorenzini, 2014).

In the North of Portugal, the Municipality of Braga is aware that the vast natural and environmental heritage of the region is a source of pride for all Braga's citizens, it also represents a huge responsibility for environmental preservation and appreciation. Knowing that, it was implemented a model of environmental action based on three strategic vectors: Sustainability of Resources, Enhancement of Natural Resources and Use of spaces (Braga Municipality Website, 2019).

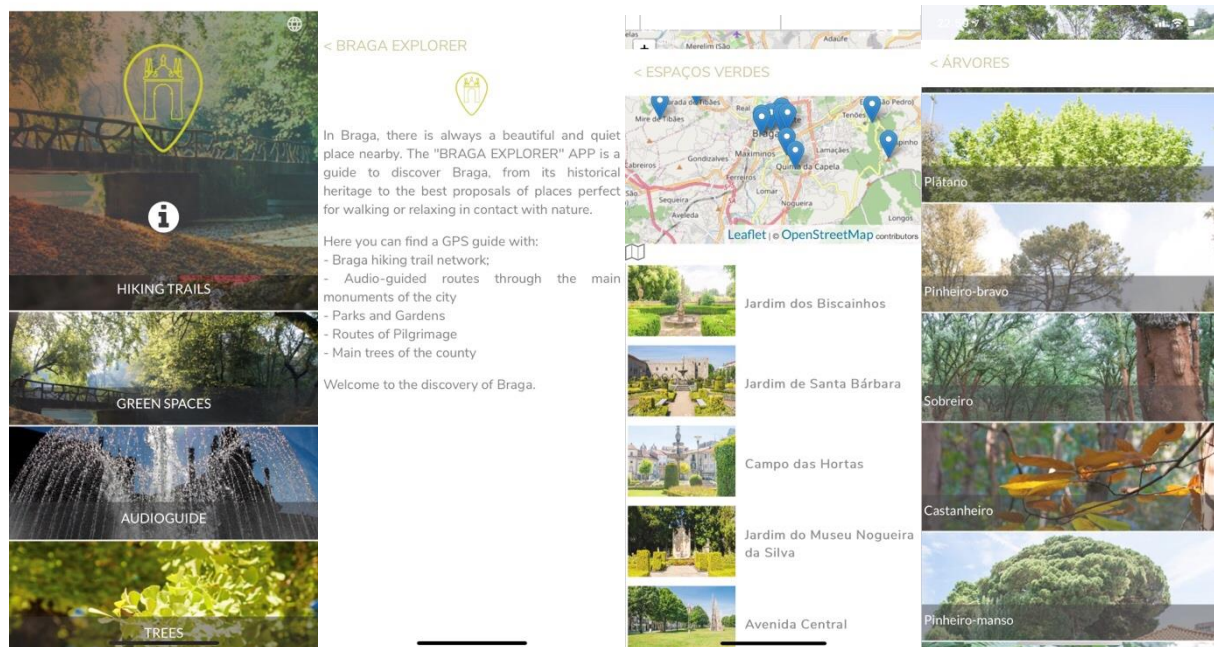


Figure 18 – Braga Explorer App Overview - Green Areas Management

The images above are screenshots from the Braga Explorer App, which is a guide to discover the region and allows the user to find: Braga's hiking trail network, Parks & Gardens, Routes of Pilgrimage, Main trees of the county and Audio-guided routes through the main monuments of the city (Braga Explorer App, 2020). For each of the spaces, more pertinent information about them is displayed, namely the location and identification of the bus lines that cross nearby, the services available, the respective description and photographs. The tool also displays trees classified as Public Interest, recognized by the Institute for Nature Conservation and Forests, and still other species that stand out in the panorama of the Municipality. (Braga Municipality Website, 2019).

2.8. SMART TOURISM APP

In an increasingly globalized and extremely dynamic environment, innovation is the key element for cities and tourism destinations to be competitive (Del Chiappa and Baggio, 2015). A destination is not smart because it makes intensive use of technology. It is smart because it also uses technology to seek a deeper understanding about the characteristics and meaning of human mobility. It uses latent knowledge and capacities to empower local institutions and industries to create knowledge-based policies and advanced mobile services for visitors. (Lamsfus et. al., 2015) Smart tourism is an individual tourist support system within the context of information services and an all-encompassing technology. (Li et. al., 2017)

In Portugal, a great example of Smart Tourism is the app already functional in Porto, North of Portugal. From a tourist perspective, Porto is a historical city, rich in tangible and intangible heritage, with its own traditions and identity. A desirable place to visit, Porto received more than three million overnight stays in the greater Porto area in 2013, with more than two million of these overnight stays happening in the city of Porto (Liberato et. al., 2018). The Official Apps, whose communication is sponsored by the Department of Tourism of the Porto City Council, are grouped into Transport, Culture, Art and Events and Maps and Guides (Liberato et. al., 2018). The municipality of Porto has even an app called “Porto VR 360” that can drive the tourist through the sights and history of Porto.

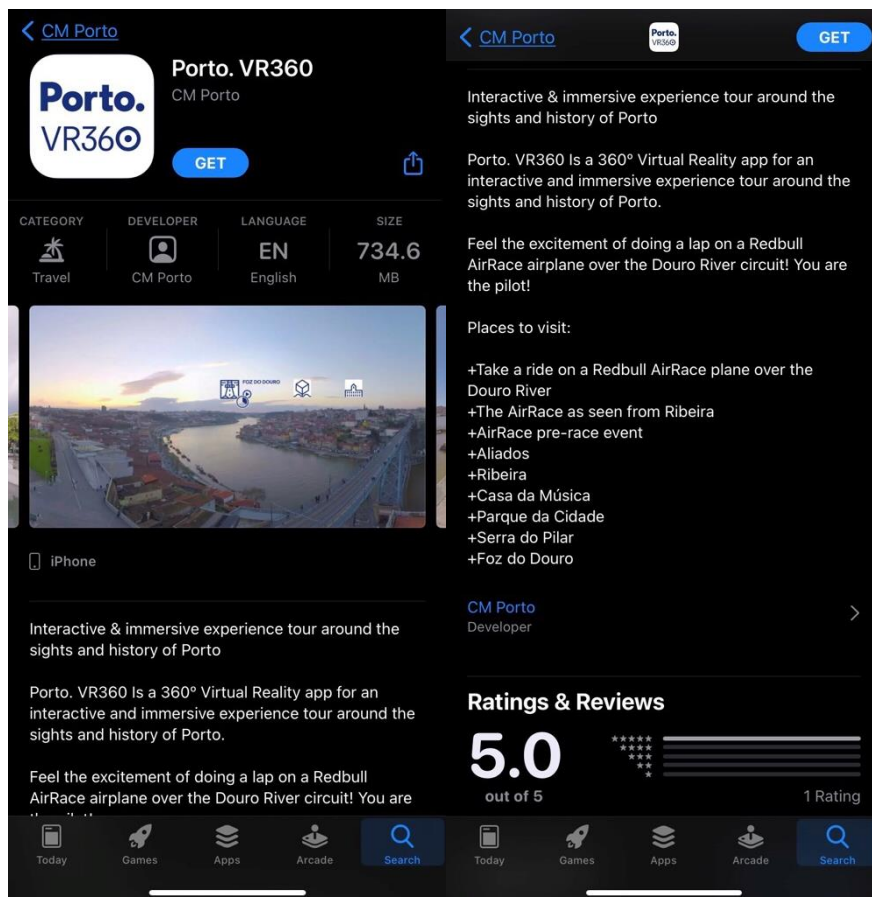


Figure 19 – Porto VR360 Tourism App, Apple Store

When a tourism destination gets smarter, the tourists’ needs and demands are expected to be fulfilled more efficiently to create a better tourist experience (Başer, 2019). The Tourism Department of the Porto City Council has been monitoring a set of indicators annually, registering an increase in values, namely the movement of passengers at the Francisco Sá Carneiro International Airport, the accommodation units promoted, the overnight stays in Porto (City), passengers in the Port of Leixões, access to the Official Tourism Portal, visitors of Municipal Museums (more accessible data), visitors of Tourist Offices, with monthly updates (Liberato et. al., 2018).

2.9. URBAN INTELLIGENCE PLATFORM

A city that sees itself as a learning platform can be opened up to some very new “ways of being and living”. People and governments can join together to co-design, co-learn and co-produce civic infrastructures, public spaces, new forms of education, transportation, public safety and other

services. (Bollier, 2016). The last classification of this study is the urban intelligence platform, that consists in the usage of technology to improve the management of a city.

Concepts such as smart cities, big & prolific data, information visualisation and predictive analytics are leading to the formation of new tools and techniques for analysing and understanding cities and their future paths of growth and development (Pettit et. al., 2015). The conceptual model of a smart city as a platform that provides access to (open) data services and urban analytics based on collected or linked data and the Internet of Everything, is to support three types of different functions: city planning and management by the municipality; development of products and services by entrepreneurs and companies; and provision of information and services to the citizen (Neto, 2018).

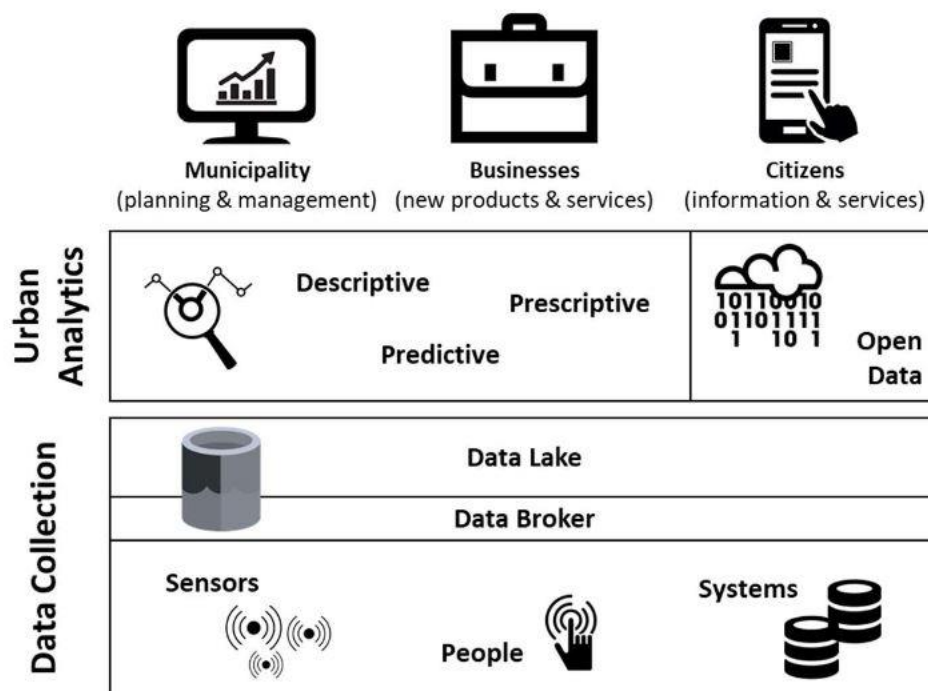


Figure 20 - Smart City as a platform (Neto, 2018)

The innovative intelligent management platform launched in 2017 in partnership between the Lisbon City Council and NEC Corporation, supports the ambition of the city of Lisbon to be a leading city at European level in terms of smart cities. The creation of a smart city infrastructure platform allows the city to integrate a variety of data sources, that work in conjunction with artificial intelligence (AI) and internet of things (IoT) technologies to gather, store and analyse multiple city data (Smart Cities Network, 2019). The objectives of the project are to ensure the intelligent management of the city, where those responsible for various municipal and external services can work in a preventive, integrated, articulated and cooperative manner based on multisectoral information (Câmara Municipal de Lisboa, 2019).

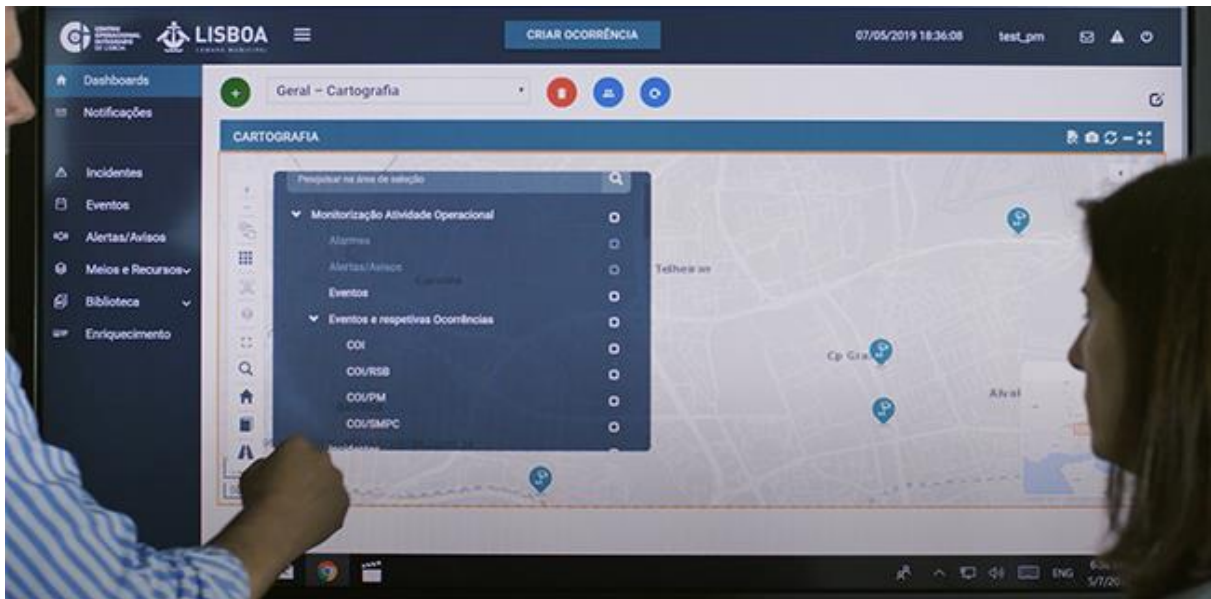


Figure 21 - Lisbon's intelligent management platform (Smart Cities Network, 2019)

The biggest challenge of the project was to deal with the complex network of data spread over different applications and locations. Today the platform manages and makes available relevant data obtained from municipal information systems and from more than 30 public and private institutions. The NEC platform is helping the Lisbon City Council to significantly improve mobility, public security, efficiency in the management of city operations, social cohesion and the quality of life of its citizens (Smart Cities Network, 2019).

3. METHODOLOGY

The survey was developed in April 2019 using Google Forms online survey platform and the categories were previously approved, as already mentioned. This platform was chosen because it is mobile friendly for the admin and the respondents, easy to edit the form and able to share in real time the results with all the smart cities team at the university. A trial of the original form is attached at the annexe 1 of this study.

Neto provided a list with all the phone numbers of the municipal mayors, because the first contact had to be for them, to ask their permission to participate on the inquiry on behalf of the municipality. The second contact was supposed to be directly to the responsible for the smart city department in order to obtain an email address where the survey would be sent, as a third contact.

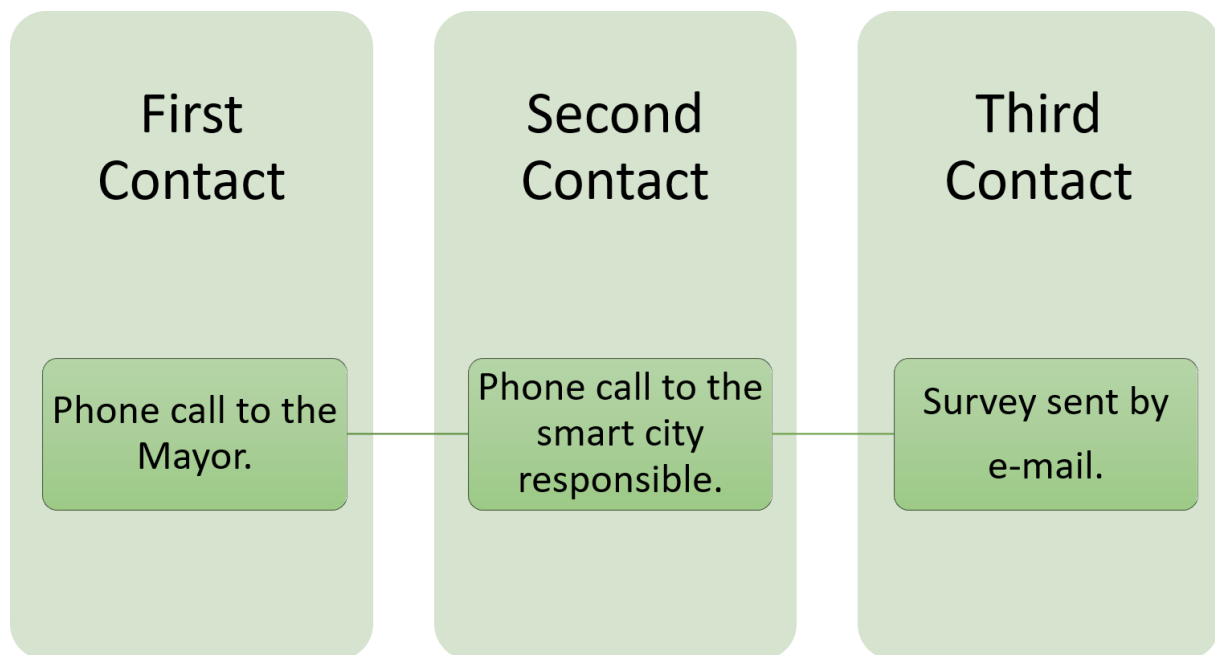


Figure 22 – Demonstration of each contact within municipalities

As demonstrated below, the first objective was to call the municipality mayor, introduce the subject of the survey, explain when & where the results would be presented and mainly ask who was the political responsible for the smart city department at the municipality.

The second objective, as well as the first contact, was to introduce the subject of the survey and explain when & where the results would be presented. In addition, it was requested to the participants answering the survey an email address. Finally, the last object was to get the survey fully answered. The first call was made in April 10th of 2019 and the last survey answered in June 12th of 2019.

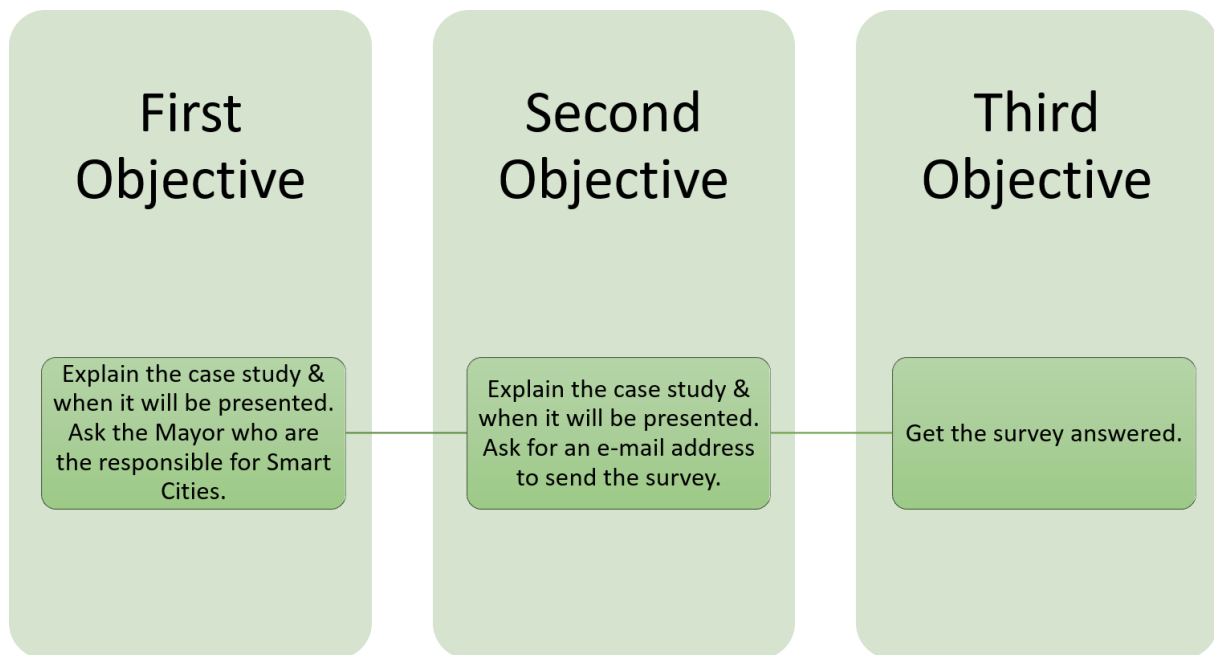


Figure 23 - Objectives of each touch points within municipalities

The list of municipalities was sorted by number of habitants, from high to low, so that, the biggest municipalities councils were reached first. This prioritization was to make sure to collect the data of the most important municipalities in Portugal and to have covered the most on demographic percentage of the country.

4. RESULTS AND DISCUSSION

Inside the 308 municipalities in Portugal, there are 136 that belong to the Smart Cities Section. This study main objective was to get the survey answered by all 136 municipalities. For further comparisons, 136 municipalities will be considered 100%. The macro overview of the collected results is shown below and all the detailed charts for each answer are on the Appendix of this study.

Even though 100 municipalities of the Smart City Section was reached by call, which means 73.5% of the total, only 32% finished answering the survey. Unfinished surveys were considered valid but they were just partially filled and not concluded.

<i>Total of Portuguese Municipalities</i>	308
<i>Municipalities of Smart Cities Section</i>	136
<i>Municipalities reached by call</i>	100
<i>Outgoing Calls</i>	245
<i>E-mails sent</i>	57
<i>Survey Answers</i>	53
<i>Survey Valid/Unfinished Answers</i>	49
<i>Survey Finished Answers</i>	45
<i>New Contacts of responsible for Smart Cities</i>	119

Table 1 - Overview and macro survey results

The high number of outgoing calls pertains to all the intentions of contacts that were not hanged up or the person was not able to talk at the moment, as well as the effective ones. For the answers, all the intentions to open the online survey were classified but the respondent had not necessarily started to answer it but it has a valid answer classification to show how many respondents started the survey correctly. The finished answers are equal to 32% from the total and its data will be described below.

The next table is a list of the 49 municipalities that answered the survey even that have not been finished. The sample of answers will include all these Portuguese locations data.

Abrantes	Cantanhede	Funchal	Lisboa	Ponta Delgada	São Brás de Aportel	Vendas Novas
Águeda	Cascais	Fundão	Maфра	Portalegre	Seixal	Vila de Rei
Alenquer	Castelo Branco	Gouveia	Marco de Canaveses	Portimão	Setúbal	Vila Nova de Famalicão
Almada	Chamusca	Grândola	Matosinhos	Porto de Mós	Sever do Vouga	Vila nova de Poiares
Amadora	Évora	Guimarães	Oeiras	Reguengos de Monsaraz	Tomar	Vila Pouca de Aguiar
Braga	Faro	Lagos	Palmela	Santa Maria da Feira	Torres Vedras	Vila Real
Bragança	Figueiró dos Vinhos	Leiria	Penela	Santo Tirso	Valongo	Viseu

Table 2 – Simplified list of the 49 Portuguese Municipalities that answered the survey, sorted A to Z

While the respondents were submitting their answers, the data was separated to solve the two main problems of the research itself: whom were the technical professionals & politicians responsible for smart cities in Portugal and which were the current or planned projects regarding the topic.

A summary of the results is presented below on the next table, showing the percentages of the classifications selected for this study.

<u>Classifications</u>	<u>YES</u>	<u>NO</u>
Public Wi-fi	81,6%	12,4%
Participatory Budgeting	66,7%	33,3%
Smart Management of solid waste	38,8%	61,2%
Smart Public Lighting	40,8%	59,2%
Smart Parking Systems	12,2%	87,8%
Fix My Street	49%	51%
Smart Management of green spaces	31,3%	68,8%
Smart Tourism App	36,7%	63,3%
Urban Intelligence Platform	33,3%	66,7%

Table 3 - Results

From the nine classifications, the most disseminated with a high score of 81,6% was the Public Wi-fi. Many municipalities reported that it's good for the tourists and helps the citizens connect to the internet. The second major topic in Portugal with 66,7% is Participatory Budgeting. Many different implementations were found for this initiative and most of them have an exclusive section on the municipality website.

The Smart Management of Solid Waste was the topic that eight municipalities claimed to be a project in negotiation or implementation status. That initiative will have a high increase of adherents on a short period of time. For the Smart Public Lighting, even with the high score of affirmative answers, most of the comments reports that the solution is just for parks and specific commonwealth regions of the municipality. None of them mentioned if they are planning on increasing the area covered by this solution. The usage of LED lights and flow sensor in order to save energy and public resources was highly mentioned as well.

The classification with less percentage was Smart Parking Systems, which several municipalities claimed to not have enough problems with traffics and parking lots to need this type of solution. The Fix my Street topic reached almost half of the municipalities getting 49% of presence. The comments mentioned that the citizens are used to sending e-mails, contacting through social media or exclusive website to report issues to the municipalities.

Smart Management of green spaces has the second lower rating and the majority of the comments are related to the existence of a system that waters the green areas automatically, which is not exactly related to the question.

The last classifications, Smart tourism App and Urban Intelligence Platform, are not the best rated but even with the low score, the few existent initiatives are very well implemented and developed on a high level of complexity.

Another great achievement of the survey was the comparable high number of contacts collected. As contacts were considered contact names with phone numbers and/or contact names with e-mail address from politicians, engineers, assistants, etc; even from the same municipality. All 119 contacts were listed and delivered to the researchers of NOVA Cidade – Urban Analytics LAB to improve their network database of the Smart Cities contact list in Portugal. The answers that mentioned personal contacts will not be shown in this study due to privacy.

There were two questions regarding who are the people responsible for the SC project at the municipality and which are their roles at the council. The goal was to understand if there was a political and a technical staff that managed the SC initiatives.

The results are on the table below, showing that both political and technical staff are easily found as responsible for the SC initiatives in the municipalities that've answered the survey.

Who is responsible for the Smart Cities department?	<u>YES</u>	<u>NO</u>
Is there a POLITICAL responsible for Smart Cities projects?	87,5%	12.5%
Is there a TECHNICAL responsible for Smart Cities projects?	71,4%	28,6%

Table 4 - Results

From the 42 affirmative answers, when detailing the position/job role of the political responsible on the table below, it shows that mainly the president or the councilman will manage the SC topics.

President	12
Vice President	7
Councilman/Alderman	19
Chief Officer	2
Municipal Director	1
President's Assistant	1

Table 5 – Political Responsible for SC

From the 31 affirmative answers, when detailing the position/job role of the technical responsible on the table below, the section manager or the technical manager are commonly responsible for SC matters.

Director	3
Section Manager (chefe da divisao)	14
Technical Manager	10
Technical Coordinator	4

Table 6 – Technical Responsible for SC

The high rate of politicians and technicians that are responsible for SC is a very good sign that the municipalities are in for a long term commitment and really planning to improve their initiatives and wellbeing of citizens.

5. CONCLUSIONS

5.1. THE URBAN INTELLIGENCE RADAR

The results of this survey shows that there are a lot of open fields for improvement & development to the citizens in Portugal, regarding SC. With just around 30% of the municipalities of the country covered under the ANMP SC Section, several great projects were able to be known and mapped.

After receiving all the data from this study, Prof. Miguel de Castro Neto was able to create the Urban Intelligence Radar using Power BI software. This solution brings the results to a visual perspective and the data can be understood with ease.

The Urban Intelligence Radar of Portugal Municipalities was first presented by the professor himself in Lisbon, at the autarch summit, on the first day of the Portugal Smart Cities Summit 2019.



Figure 24 - Urban Intelligence Radar, Page 1

Using the radar, Prof. Neto was able to show the audience a demographic map with accurate percentages from this survey. The first dashboard below, shows demographically where the counties that belongs to the Smart Cities Section in Portugal are, highlighting them in green colour. The percentages of how many political & technical responsible are displayed and the percentages of how many counties have a SC strategy and a SC intelligent platform as well.

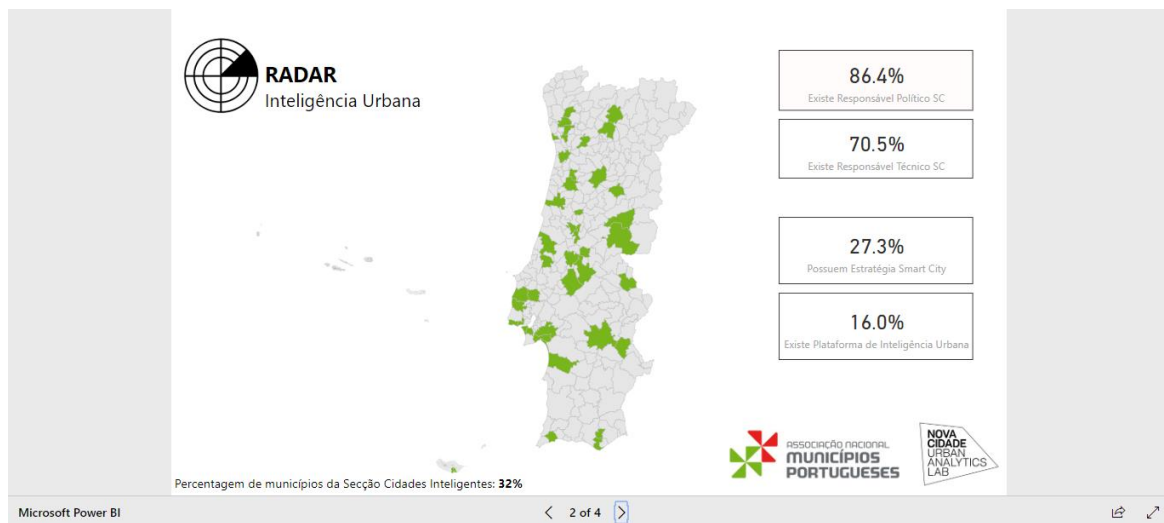


Figure 25 Urban Intelligence Radar, Page 2

The second chart is a spider radar that shows the total rates for the nine classifications simultaneously. As already discussed on this study, Participatory Budgeting and Public Wi-fi are the most commonly found regarding the studied municipalities.

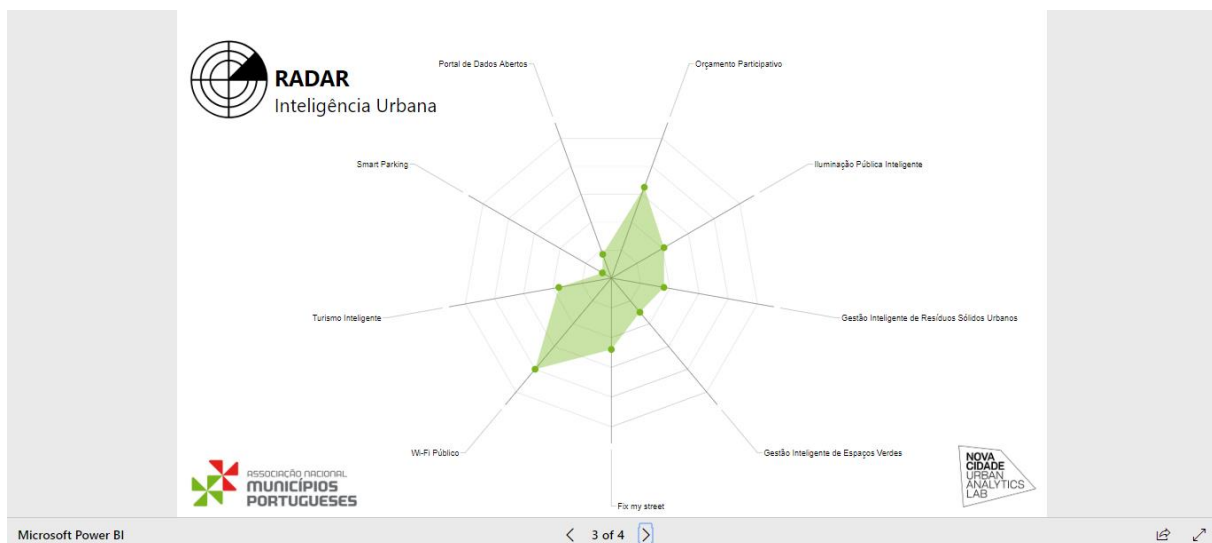


Figure 26 - Urban Intelligence Radar, Page 3

The last dashboard of the Urban Intelligence Radar is able to show the data individually, when selecting each municipality. When selecting one single county, all the figures related to that county will appear on the dashboard, highlighting the position of it on the map as well.

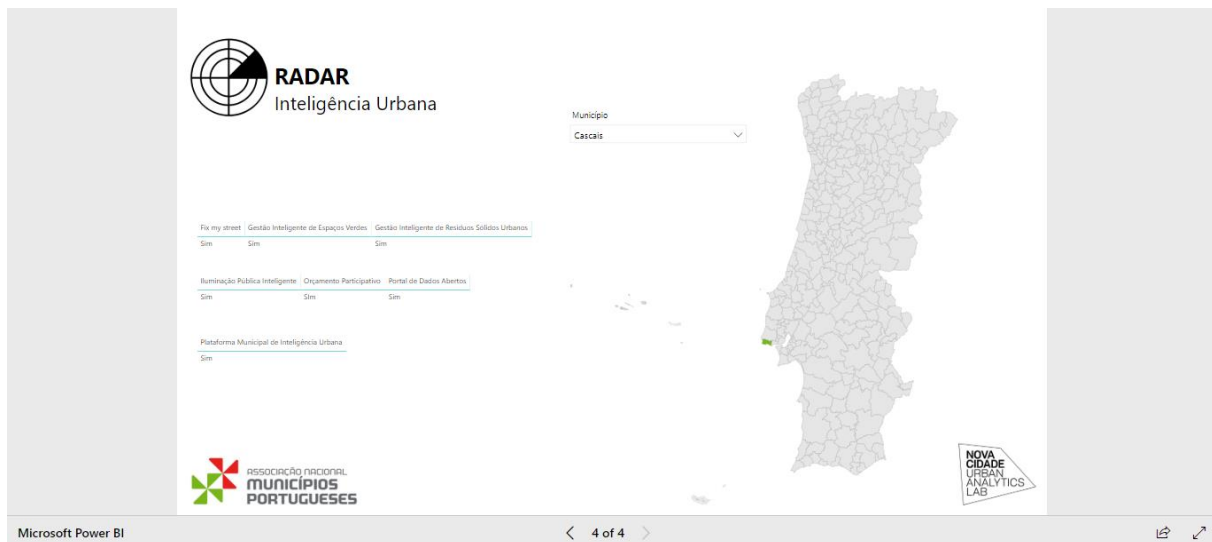


Figure 27 - Urban Intelligence Radar, Page 4

The Urban Intelligence Radar is a really well developed dashboard that provides accurate data on an outstanding format and new data can be imported to the dashboards. So that, for further studies, the same radar can be updated and increases a historical perspective to the growth.

5.2. THE SMART PORTUGAL SOCIAL NETWORK

The exchange of information, knowledge and networking between the municipalities is already a reality. It's clear that a well-developed SC topic from one side of the country could be also implemented on the other side. The existence of innumerable innovative urban intelligence projects that are being developed in the different counties of our country creates a unique opportunity for the exchange of experiences and for the construction of a knowledge sharing community (Smart Portugal, 2020).

The Smart Portugal project is a social network that connects people and projects of urban intelligence in Portugal. The platform is a partnership between the NOVA Cidade and the ANMP. It intends to support the management of knowledge of urban intelligence and constitute itself as a network of the best municipal projects that supports the sharing of good practices and the lessons learned in the process (Smart Portugal, 2020). On May 2021, the social network already has 88 disclosed projects, 89 members and 23 municipalities connected.

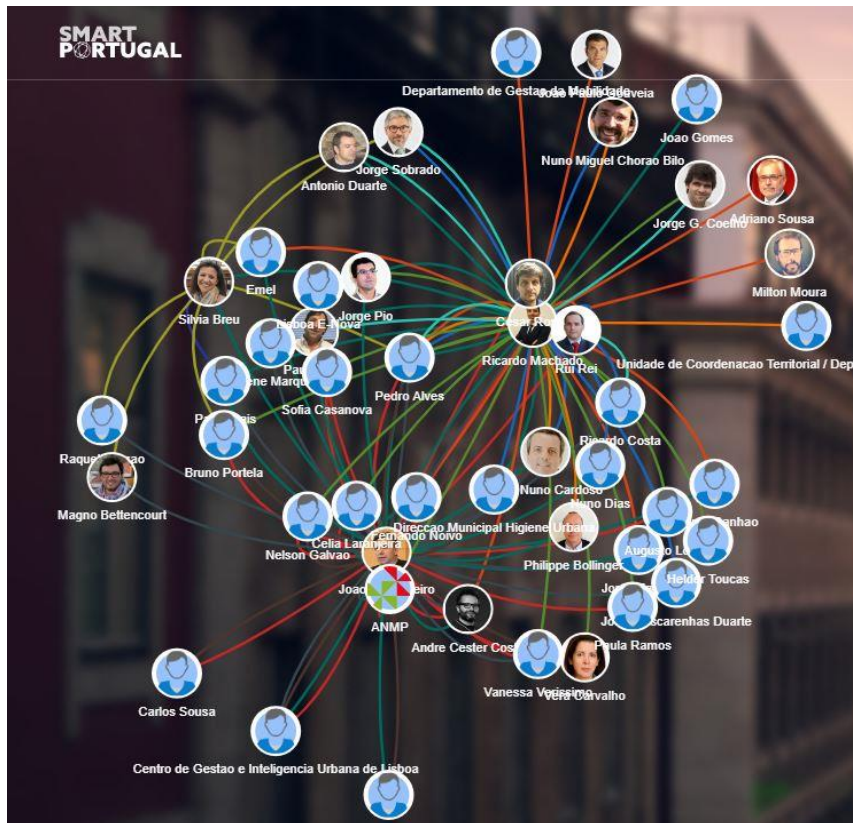


Figure 28 - Smart Portugal Social Network

A lot of learning is been shared on the Smart Portugal platform through the 88 already submitted projects, at the present moment. The users are able to publish projects from the counties with descriptions, objectives, details, maps and contacts, adding an extraordinary value to this social network. To publish content, the user needs to have a login but all the info about the projects itself is available as open data to the general public.

The power of spreading content that a social network has, will leverage the actual knowledge hold by their users to more people. The SC network has all the potential to increase the number of people, companies and municipalities involved to bring Portugal to the next level of urban intelligence.

5.3. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORKS

The limitations of this study are mainly the difficulty to reach and to get an answered call from the person responsible for Smart Cities of each municipality. When calling the municipality council, without knowing the name of the person responsible or who would be able to answer the survey was definitely a challenge. As a recommendation for future studies, the best usage of your time is to first search the website of the municipality council to understand or, some times, to even find the name of the person responsible.

The survey had a high bounce rate of 51%, meaning that from 100 municipalities reached, just 49 started to answer the survey. So it could be almost half more efficient if the respondents were motivated to answer all the questions. As a recommendation for future works, this survey framework could be refined & extended and a more efficient way of contacting the municipalities could be improved as well.

My last recommendation for future researchers is to map and sort the municipalities list using demographic data. That is, start to collect data reaching the municipalities that have more population. Some good usage of your time is to think how to cover not only the maximum number of surveys answered, but focus in receiving data from the majority of the population. A demographic map of the smart cities in Portugal can be a nice topic for future works.

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7. APPENDIX – THE SURVEY RESULTS

At this present moment the survey has already been answered by the municipalities responsible.

1. Who is responsible for the Smart Cities department? - Is there a POLITICAL responsible for Smart Cities projects?

Há um responsável POLÍTICO pelos projetos de Smart Cities?

48 respostas

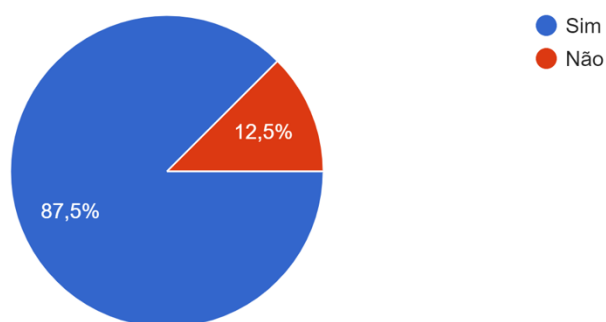


Figura 1 - Answer of question 1

1.2 What is the job role of the political responsible?

Cargo:

42 respostas

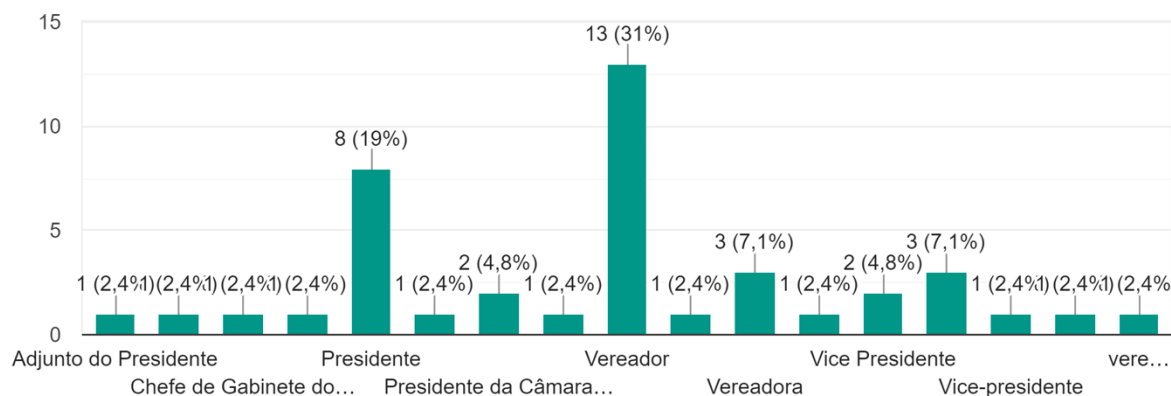
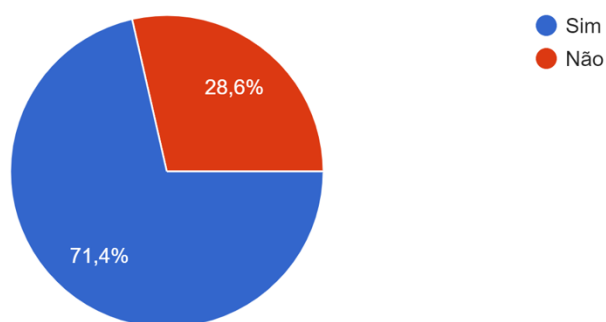


Figura 2 - Answer of question 1.2

1.3 Who is responsible for the Smart Cities department? - Is there a TECHNICAL responsible for Smart Cities projects?

Há um responsável TÉCNICO pelos projetos de Smart Cities?

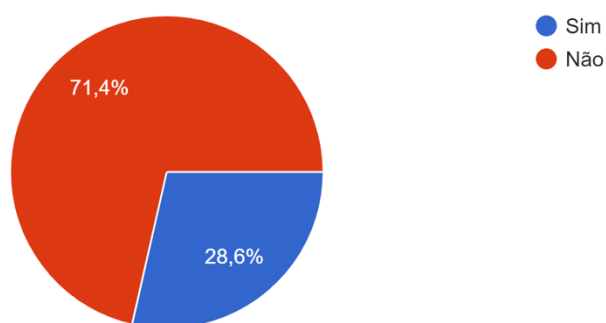
49 respostas



2. Smart Cities Strategies - Is there a Smart City Strategic Document?

Há um documento estratégico focado em Smart City para o município?

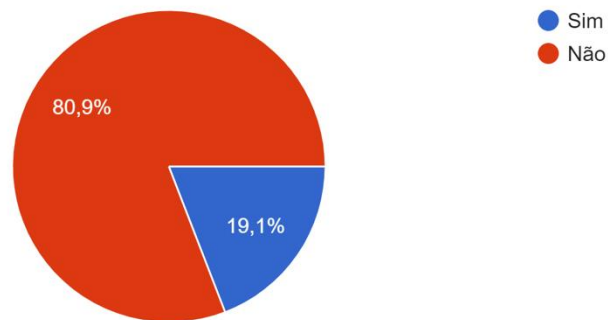
49 respostas



2.1 Smart Cities Strategies - Is there an open data portal?

Há um portal de dados abertos?

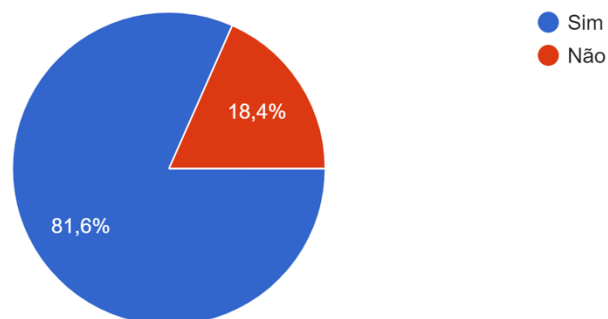
47 respostas



3. Public Wi-fi - Do citizens have free internet access provided by the municipality?

Os cidadãos dispõem de acesso à internet gratuito fornecido pelo município?

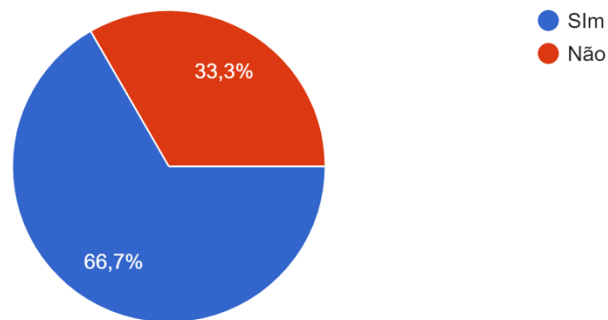
49 respostas



4. Participatory budgeting - Is there any form of participatory budgeting?

Há alguma forma de orçamento participativo?

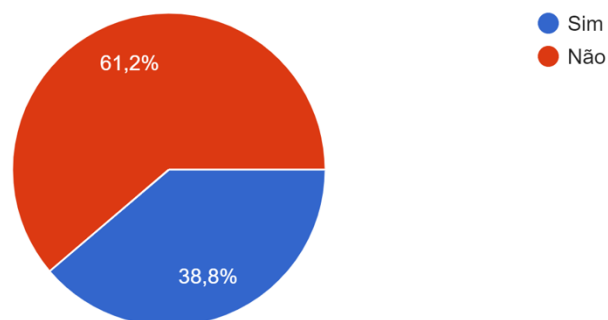
48 respostas



5. Intelligent management of municipal solid waste - Is there a system for monitoring waste and optimizing collection routes?

Existe um sistema de monitorização de resíduos e de otimização de rotas de recolha ?

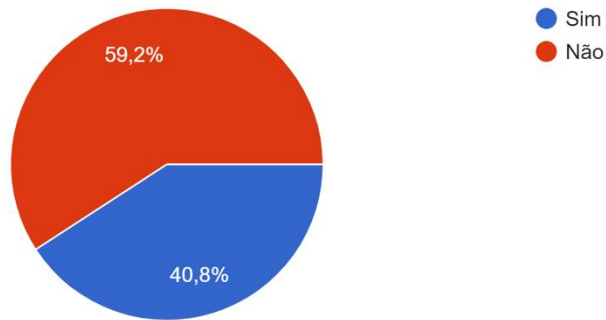
49 respostas



6. Intelligent public lighting - Is there intelligent light control?

Há controlo de luz inteligente?

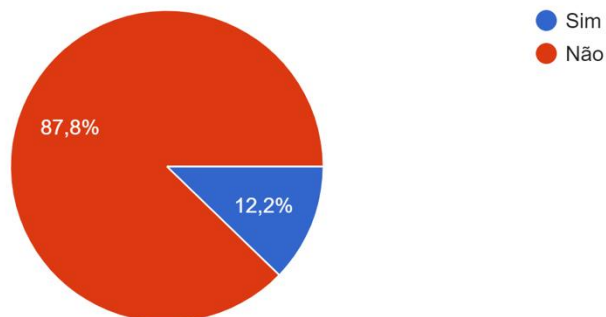
49 respostas



7. Smart Parking Systems - Are there smart parking solutions?

Há soluções de smart parking?

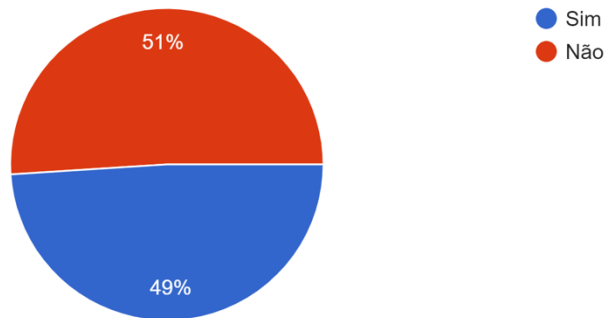
49 respostas



8 - Fix my street - Is there a Fix my street project or similar?

Existe "Fix my street" ou projeto semelhante?

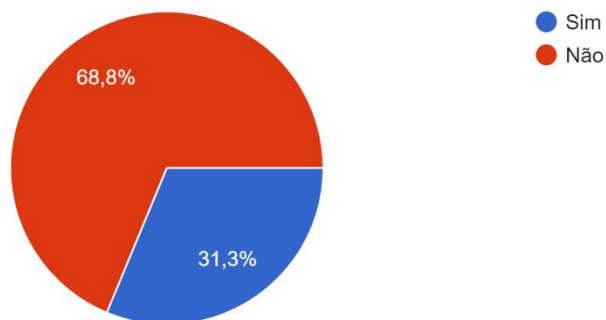
49 respostas



9 - Intelligent management of green spaces - Is there intelligent management of green spaces?

Há gestão inteligente de espaços verdes?

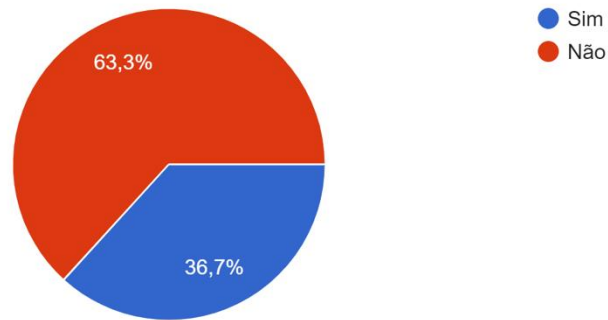
48 respostas



10 - Smart tourism by app - Is there an app for smart tourism in the county?

Há um app para turismo inteligente no município?

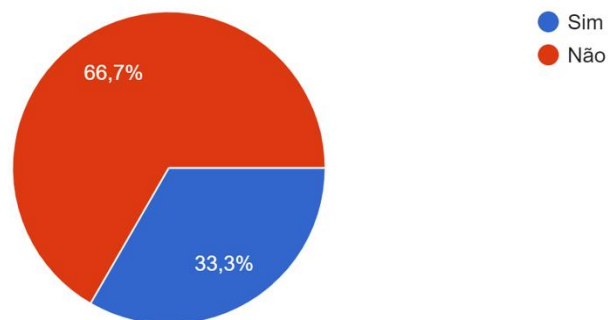
49 respostas



11 - Urban intelligence platform - Is there a municipal urban intelligence platform?

Existe uma plataforma municipal de inteligência urbana?

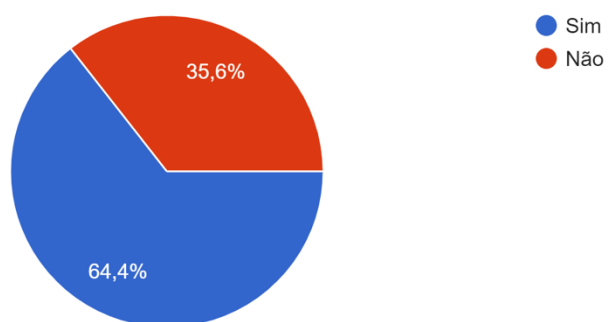
12 respostas



12 - Other projects for smart cities - Are there other projects for smart cities?

Há outros projetos para cidades inteligentes?

45 respostas



8. ANNEXES 1 – PORTUGUESE MUNICIPALITIES OF SMART CITIES SECTION LISTED



ASSOCIAÇÃO NACIONAL
MUNICÍPIOS
PORTUGUESES

30
ANOS

1 » Abrantes	47 » Figueiró dos Vinhos	93 » Porto
2 » Águeda	48 » Fornos de Algodres	94 » Porto de Mós
3 » Aguiar da Beira	49 » Funchal	95 » Porto Santo
4 » Albufeira	50 » Fundão	96 » Póvoa de Varzim
5 » Alcácer do Sal	51 » Góis	97 » Proença-a-Nova
6 » Alcanena	52 » Gondomar	98 » Reguengos de Monsaraz
7 » Alcochete	53 » Gouveia	99 » Ribeira Grande
8 » Alcúcutim	54 » Grândola	100 » Sabugal
9 » Alenquer	55 » Guarda	101 » Salvaterra de Magos
10 » Alfândega da Fé	56 » Guimarães	102 » Santa Maria da Feira
11 » Almada	57 » Horta	103 » Santa Marta de Penaguião
12 » Almeida	58 » Ilhavo	104 » Santarém
13 » Amadora	59 » Lagoa (Açores)	105 » Santo Tirso
14 » Anadia	60 » Lagoa (Algarve)	106 » São Brás de Alportel
15 » Arraiolos	61 » Lagos	107 » São Pedro do Sul
16 » Arruda dos Vinhos	62 » Lamego	108 » Seia
17 » Aveiro	63 » Leiria	109 » Seixal
18 » Azambuja	64 » Loulé	110 » Setúbal
19 » Baião	65 » Loures	111 » Sever do Vouga
20 » Barcelos	66 » Lourinhã	112 » Silves
21 » Barreiro	67 » Lousã	113 » Sintra
22 » Batalha	68 » Macedo de Cavaleiros	114 » Tábua
23 » Beja	69 » Mafra	115 » Tavira
24 » Benavente	70 » Maia	116 » Terras de Bouro
25 » Bombarral	71 » Mangualde	117 » Tomar
26 » Boticas	72 » Manteigas	118 » Tondela
27 » Braga	73 » Marco de Canaveses	119 » Torres Novas
28 » Bragança	74 » Matosinhos	120 » Torres Vedras
29 » Cadaval	75 » Miranda do Douro	121 » Trofa
30 » Caldas da Rainha	76 » Mirandela	122 » Vagos
31 » Cantanhede	77 » Moimenta da Beira	123 » Vale de Cambra
32 » Cascais	78 » Mondim de Basto	124 » Valongo
33 » Castelo Branco	79 » Mortágua	125 » Vendas Novas
34 » Castelo de Paiva	80 » Murtosa	126 » Viana do Castelo
35 » Chamusca	81 » Nelas	127 » Vila de Rei
36 » Chaves	82 » Odemira	128 » Vila Nova de Cerveira
37 » Coimbra	83 » Oeiras	129 » Vila Nova de Famalicão
38 » Condeixa-a-Nova	84 » Olhão	130 » Vila Nova de Gaia
39 » Coruche	85 » Oliveira de Azeméis	131 » Vila Nova de Poiares
40 » Entroncamento	86 » Palmela	132 » Vila Pouca de Aguiar
41 » Esposende	87 » Penela	133 » Vila Real
42 » Évora	88 » Pinhel	134 » Vila Viçosa
43 » Fafe	89 » Pombal	135 » Viseu
44 » Faro	90 » Ponte de Sor	136 » Vouzela
45 » Figueira da Foz	91 » Portalegre	
46 » Figueira de Castelo Rodrigo	92 » Portimão	

9. ANNEXES 2 – SURVEY FORM



Survey on the Maturity of Smart Cities in Portugal

Introduction:

This is a study about the maturity of the Smart Cities in Portugal that is being carried out by the Smart Cities Section of the National Association of Portuguese Municipalities with the support of the NOVA University of Lisboa. It will be presented at the Autarch Summit on Portugal Smart Cities at May 21th 2019.

The questionnaire takes approximately 10 minutes to respond, thanking you for your support or forwarding to the local coach who could do so. If you feel it necessary to leave any further comments, there is a field of remarks at the end of each section of the survey.

His answer is of enormous relevance to the knowledge about the reality of urban intelligence in our country.

Thank you for your support.

Data of the Municipality

Description of the Municipality and data of who is responding to the survey.

County:

Sua resposta

Name of respondent:

Sua resposta

Date

Data

dd/mm/yyyy

Observations:

Sua resposta

PRÓXIMA



Página 1 de 13

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Survey on the Maturity of Smart Cities in Portugal

1 - Who is responsible for the Smart Cities department?

Explanation: Within the municipality are the technical and political responsible for the implementation of projects in Smart Cities and the identification of the position.

Is there a POLITICAL responsible for Smart Cities projects?

☐ Yes

☐ No

Contact name:

Sua resposta

E-mail:

Sua resposta

Position:

Sua resposta

Is there a TECHNICAL responsible for Smart Cities projects?

☐ Yes

☐ No

Contact Name

Sua resposta

E-mail:

Sua resposta

Position:

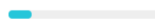
Sua resposta

Observations:

Sua resposta

VOLTAR

PRÓXIMA



Página 2 de 13

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Survey on the Maturity of Smart Cities in Portugal

2 - Smart Cities Strategies

Identification of Smart Cities strategies within the municipality.

Is there a strategic document focused on Smart City for the municipality?

☐ Yes

☐ No

What document(s)?

Sua resposta

Is there an open data portal?

☐ Yes

☐ No

What is the access link?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

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Página 3 de 13

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Survey on the Maturity of Smart Cities in Portugal

3 - Public Wi-fi

Explanation: there is free internet access provided by the municipality in public areas.

Do citizens have free internet access provided by the municipality?

☐ Yes

☐ No

Which company is responsible for implementation?

Sua resposta

When has it been or will it be implemented?

Data

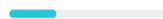
dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

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Survey on the Maturity of Smart Cities in Portugal

4 - Participatory budgeting

Explanation: participative portal where citizens can inform themselves, choose and invest in their areas of interest of the city.

Is there any form of participatory budgeting?

☐ Yes

☐ No

What is the access link?

Sua resposta

What is the technology supplier?

Sua resposta

When has it been or will it be implemented?

Date

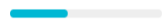
dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

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Survey on the Maturity of Smart Cities in Portugal

5 - Intelligent management of municipal solid waste

Is there a system for monitoring waste and optimizing collection routes?

☐ Yes

☐ No

Which company is responsible for the system?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

PRÓXIMA

Página 6 de 13

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Survey on the Maturity of Smart Cities in Portugal

6 - Intelligent public lighting

Explanation: concern to provide light according to the needs of citizens with control of the lighting of public areas.

Is there intelligent light control?

- ☐ Yes
☐ No

Which supplier is responsible for the technology /installation?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

PRÓXIMA



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Survey on the Maturity of Smart Cities in Portugal

7 - Smart Parking Systems

Explanation: Smart sensors that manage the available parking spaces for cars.

Are there smart parking solutions?

☐ Yes

☐ No

Which company is responsible for the solution?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

PRÓXIMA



Página 8 de 13

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Survey on the Maturity of Smart Cities in Portugal

8 - Fix my street

Explanation: Participatory method of identification and monitoring of problems related to public space, where citizens can register occurrences and inform the municipality.

Is there a Fix my street project or similar?

☐ Yes

☐ No

What is the access link?

Sua resposta

Which provider is responsible for the technology?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

PRÓXIMA



Página 9 de 13

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Survey on the Maturity of Smart Cities in Portugal

9 - Intelligent management of green spaces

Concern about environmental sustainability, maintenance and mapping of green spaces, automation of irrigation control and meteorological stations.

Is there intelligent management of green spaces?

☐ Yes

☐ No

What is the access link?

Sua resposta

Which company is responsible for the technology?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

PRÓXIMA



Página 10 de 13

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Survey on the Maturity of Smart Cities in Portugal

10 - Smart tourism by app

Explanation: App that provides data (maps and tourist information) about the municipality.

Is there an app for smart tourism in the county?

☐ Yes

☐ No

What is the name of the app?

Sua resposta

Which company is responsible for the technology?

Sua resposta

When has it been or will it be implemented?

Date

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR PRÓXIMA



Página 11 de 13

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Google Formulários



Survey on the Maturity of Smart Cities in Portugal

11 - Urban intelligence platform

Is there a municipal urban intelligence platform?

☐ Yes

☐ No

Which supplier is responsible for the technology?

Sua resposta

When has it been or will it be implemented?

Sua resposta

Observations:

Sua resposta

VOLTAR

PRÓXIMA



Página 12 de 13

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Survey on the Maturity of Smart Cities in Portugal

12 - Other projects for smart cities

Explanation: Identification of more Smart Cities related projects that the municipality is planning.

Are there other projects for smart cities?

☐ Yes

☐ No

Which are?

Sua resposta

When has it been or will it be implemented?

Data

dd/mm/yyyy

Observations:

Sua resposta

VOLTAR

ENVIAR



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