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SMART CITIES: IMPLEMENTATION VS. DISCOURSES

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DISCLOSURE

This research has been validated through the publication of parts of it in the form of articles in conferences and scientific journals that are partially reproduced in this work.

The link of each of the chapters with the different publications is explained at the beginning of each chapter. The list of publications is at the end of the work and the publications are attached as annexes.

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Smart Cities: implementation vs. discourses.**ABSTRACT**

In recent years many initiatives have been developed under the Smart City label in a bid to provide a response to challenges facing cities today. Many of these initiatives have been developed in the European Union, leading to the elaboration of specific policies and programs to foster them. The Smart City concept has evolved from a sector-based approach to a more comprehensive view that places governance and stakeholders' involvement at the core of strategies. However, Smart Cities are usually implemented through projects at a smaller scale of which the impacts are difficult to be measured. Therefore, the ability of Smart City initiatives to provide an integrated and systematic answer to urban challenges is constantly being called into question. Stakeholders' involvement in both the projects and the city strategy is key to develop a governance framework that allows an integrated and comprehensive understanding. This can only be done if Smart City strategies take the stakeholders' opinion into account and seek a compromise between their views and the implementation of the strategy. Multiple attempts have been made to analyze Smart Cities, but tools are needed to understand their complexity and reflect the stakeholders' role in developing Smart City initiatives and their capacity to face urban challenges. This research pursues three objectives: (A) to develop a conceptual model capable of displaying an overview of (a) the stakeholders taking part in the initiative in relation to (b) the projects developed and (c) the challenges they face; (B) to use this model to synthesize the opinion of different stakeholders involved in Smart City initiatives and compare their attitudes to the key projects implemented in a corresponding SC strategy at different stages and (C) to extract guidelines for Smart City development in the European Region. The methodology combines project analysis with surveys and interviews with different groups of key stakeholders (governments, private companies, universities and research centers, and civil society) through text analysis. The conceptual model is developed through discussions with different European stakeholders and is applied to three case studies: Vienna, Milan and Barcelona. Partial conclusions and guidelines are extracted for each of the cities. Finally general conclusions about Smart City implementation in Europe, as well as about the use of the developed conceptual model, are presented as a result of this work.

Smart Cities: implementation vs. discourses.**RESUMEN**

Durante los últimos años, numerosas iniciativas se han desarrollado utilizando la etiqueta de “Smart City” en un intento de dar respuesta a los retos que enfrentan las ciudades hoy en día. Muchas de estas iniciativas las ha desarrollado la Unión Europea, liderando la elaboración de políticas específicas y programas que las promovían. El concepto “Smart City” ha evolucionado desde un enfoque sectorial a una visión más integral en la que la gobernanza y la implicación de los actores han de ser nucleares en el desarrollo de las estrategias.

No obstante, las “Smart Cities” normalmente se implementan a través de proyectos de menor escala cuyos impactos son difícilmente medibles. Es por ello que la habilidad de las iniciativas “Smart Cities” para facilitar una respuesta integral y sistemática a los retos urbanos está constantemente en entredicho. La vinculación de los actores claves tanto en los proyectos como en la estrategia urbana es una pieza clave para desarrollar un marco de gobernanza que permita comprender el problema desde una perspectiva integral y comprehensiva. Esto solo podrá llevarse a cabo si las estrategias vinculadas con las “Smart Cities” tienen en cuenta las opiniones de los actores claves y buscan tanto un consenso entre sus visiones como la implementación de la estrategia. Pese a los numerosos intentos de analizar las estrategias vinculadas a las “Smart Cities”, todavía se hacen necesarias herramientas que permitan comprender la complejidad de las mismas y reflejen el papel de los actores a la hora de desarrollar iniciativas vinculadas con las “Smart Cities”, así como la capacidad de estas iniciativas cuando se trata de enfrentar los diferentes retos urbanos. El objetivo de esta investigación, por tanto, es triple (A) desarrollar un modelo conceptual que permita mostrar una visión general de (a) los actores claves tomando parte en la iniciativa en relación con (b) los proyectos relacionados y (c) los retos que se enfrentan; (B) usar dicho modelo para sintetizar la opinión de los diferentes actores relacionados con “Smart Cities” y comparar sus actitudes relacionadas con los proyectos clave implementados en una estrategia SC en sus diferentes fases y (C) plantear directrices de cara al desarrollo de “Smart Cities” en Europa. La metodología propuesta combina el análisis de proyectos con encuestas y entrevistas con diferentes grupos de actores clave (gobiernos, sector privado, universidades y centros de investigación así como sociedad civil) a través de análisis de texto. El modelo conceptual se desarrolla a través de discusiones con diferentes actores europeos y se aplica a tres casos de estudio: Viena, Milán y Barcelona. De cada una de las ciudades se han extraído conclusiones parciales y recomendaciones. Finalmente, como resultado de la investigación en su conjunto, se presentan conclusiones generales sobre la implementación de iniciativas vinculadas con “Smart City” en Europa

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CHAPTER 1. INTRODUCTION

CHAPTER 1: INTRODUCTION

This chapter presents a research framework that introduces the hypothesis and objectives of this research, as well as its methodology and contents. This research framework combines the introductions to two of the main articles published as a result of this research: “Smart City implementation and discourses: An integrated conceptual model. The case of Vienna.” published in the scientific journal “Cities” (See Fernandez-Anez et al. 2017) and “Smart City Projects Assessment Matrix: Connecting Challenges and Actions in the Mediterranean Region.” Published in Journal of Urban Technology (See Fernandez-Anez et al. 2018). See annex 6 for the complete documents.

1.1. Research framework

Cities are places where agglomeration economies attain their highest yields, producing cultural, economic and social benefits (United Nations, 1996). However, growing urbanization patterns create a series of problems that reduce quality of life in urban settlements, such as inequality, pollution, ageing population, insecurity and others. The Smart City concept first emerged in the 1990s (Alawadhi et al., 2012) as an alternative to traditional planning modes, using new technologies (specially ICT) to tackle these problems. Smart cities are usually seen as a tool to solve urban challenges in an increasingly urbanized world (Albino, Berardi, & Dangelico, 2015; Chourabi et al., 2012; De Santis, Fasano, Mignolli, & Villa, 2014; Meijer & Bolivar, 2015; Nam & Pardo, 2011c).

The new concept of “smart city” arises to solve this composite set of challenges that urban settlements are facing. But despite numerous efforts, there is no consensus on the definition of it, as highlighted by several authors (Albino et al., 2015; Allwinkle and Cruickshank, 2011; Marsal-Llacuna et al., 2015, Fernandez-Anez, 2016). New approaches have appeared proposing the integration of different aspects of the smart city for its contextualization and performance analysis (Chourabi et al. 2011; Lombardi et al. 2012; Caragliu et al., 2011). This concept of a holistic smart city is applied by many authors in their research proposals (Alawadhi and Aldama-Nalda, 2012; Caragliu, Bo, and Nijkamp, 2009; Castelnovo et al., 2015; Chourabi et al., 2011; Fernández-Güell et al., 2016; Giffinger et al., 2007; Leydesdorff and Deakin, 2010).

The lack of consensus as to the definition of a Smart City has led to specific research on this topic. Several authors have designed conceptual and typological approaches to provide a systematic understanding of Smart City concepts and policies. Some authors focus on the essential components of Smart Cities, understanding the balance between people, technology and institutions (Ben Letaifa, 2015; Colldahl, Frey, & Kelemen, 2013; Nam & Pardo, 2011c) as crucial for a city to be considered Smart. Other proposals for classifying Smart City concepts and policies are based on schools of thought (Kummittha & Crutzen, 2017) or a spatial approach,

and suggest other strategic choices without any specific spatial reference (focusing on society, innovation or business models) (Angelidou, 2014). However, when the focus is on governance, authors such as Meijer & Bolivar (2015) align themselves with the ideas of Ben Letaifa, (2015) and Colldahl, Frey, & Kelemen (2013). Meijer & Bolivar (2015) classify Smart City definitions in terms of technology, human resources and collaboration, incorporating a fourth option that combines the three together in a holistic approach. According to this last perspective, urban developments should consider the interrelations between infrastructure, society and institutions. Many authors apply this concept of holistic Smart City in their research proposals (Alawadhi et al., 2012; Caragliu, Bo, & Nijkamp, 2011; Chourabi et al., 2012; Fernández-Güell, Collado-Lara, Guzmán-Araña, & Fernández-Añez, 2016; Giffinger et al., 2007; Leydesdorff & Deakin, 2010). The lack of consensus about Smart City definitions has led to the use of the Smart City conceptualization as a tool for researchers and different stakeholders to define their position (Fernandez-Anez, 2016).

However, the Smart city is more than a concept that needs to be theoretically defined. Basically, two main approaches can be identified among Smart City scientists and practitioners. On the one hand, the scientific literature seeks to go beyond sector-specific approaches by proposing a comprehensive conceptualization of the Smart City; and on the other hand, Smart City initiatives are developed through sector-based initiatives and projects in one or a few specific areas (Fernández-Güell et al., 2016; Mattoni, Gugliermetti, & Bisegna, 2015). The implementation of Smart Cities is still related to these sector-specific and partial understanding, in part because of the limitations of governance and financing tools. It is therefore necessary to bridge the gap between the theoretical comprehensive perspective and the sector-wide implementation of the Smart City concept.

Despite extensive discussion of the concept, little is known about the implementation of Smart Cities in effect: How is the Smart City concept being implemented? Are Smart cities really facing current urban challenges? Are they achieving the involvement of the different stakeholders of society? To answer these questions, it is necessary to understand the different elements separately and in a comprehensive and interrelated way.

Going beyond the Smart City concept, it is necessary to focus on how it is being implemented. Smart cities are not usually built from scratch but rather through the execution of smart city projects that must be strategically inserted into a smart city strategy (Angelidou, 2014). Traditionally, cities attempt to solve problems using a “silo” approach, which has municipal departments working separately. (Fernández-Güell et al., 2016; Marsal-Llacuna and Segal, 2016; Nam and Pardo, 2011; The Scottish Government, Scottish Cities Alliance, and Urban Tide, 2014). In this approach, cities that aim to become smart focus on enhancing specific

socioeconomic aspects of everyday living, such as business, housing, commerce, governance, health, education, or community (Angelidou, 2014; Komninos et al., 2011). This sectorial approach is largely the result of the dispersed allocation of resources and financing solutions for specific types of projects. An example would be the kind of project that aimed for optimal energy and resource efficiency, preferably by integrating technologies in the fields of transport, energy, and governance (Urban Europe, 2015; EUREKA, 2017). Nevertheless, complexity in cities must be approached with integrated strategies (Fernández-Güell et al., 2016), and the smart city approach is gradually focusing on addressing urban problems with a holistic approach. Therefore, smart city projects are increasingly coordinated by smart city strategies in cities, as in the case of Vienna (City of Vienna, 2014).

The UN Habitat conference on Housing and Sustainable Urban Development highlighted the importance of understanding cities as a solution for challenges (UN-Habitat III, 2016). Smart Cities are implemented to respond to a multitude of challenges in an increasingly urbanised world (Albino et al., 2015; L. Anthopoulos, Janssen, & Weerakkody, 2015; Chourabi et al., 2012; De Santis et al., 2014; Meijer & Bolivar, 2015; Nam & Pardo, 2011c). Therefore the ultimate purpose of Smart cities should be to become a solution for urban challenges. It is also important to face these challenges from a multi-scalar perspective, from regional to local (UN-Habitat III, 2016). Therefore the regional challenges framework could be taken as a basis for understanding the challenges a specific city must face. Reports of International entities, as well as scientific literature, is focusing in identifying challenges of cities of regions, like the European (European Commission, 2011; Nijkamp & Kourtit, 2013), with a comprehensive understanding.

In the goal of making the Smart City a comprehensive concept, governance is gradually placed at the core and is considered as one of the key elements for the success of the Smart City initiatives (Meijer & Bolivar, 2015). Authors also endorse the link between Smart governance and the need for integrated approaches (Castelnovo, Misuraca, & Savoldelli, 2015). It is key to understand the meaning of governance within the Smart City context and how is it understood in this research. Meijer & Bolivar (2015) propose the classification of Smart governance conceptualization in four levels: governance of a smart city, smart decision-making processes, smart administration and smart urban collaboration among various actors. This fourth level is considered for him to be the more transformative. We are going to take this idea of stakeholders' collaboration as a departure point.

Stakeholder involvement, collaboration and engagement in decision-making is essential for Smart governance according to most authors (Ruhlandt, 2018), and the key element for becoming a Smart City (Albino et al., 2015; Giffinger & Lü, 2015; Nam & Pardo, 2011). However, stakeholders reveal different visions of the Smart City in their discourses (Fernandez-

Anez, 2016; Fernandez, 2015). Including the visions of the different groups could be a first step to reach the collaboration level.

According to Stoker (1995) governance is getting to implement things facing complexity, conflict and social change. Therefore, getting to materialize the policies is one of the indicators of good governance. According to Le Galès (2004) governance implies “a process of coordination of actors, social groups, of institutions to achieve objectives”. However, there are also differences between the image of the Smart City and its implementation (De Santis et al., 2014) and between the vision of the stakeholders in Smart City development and the initiatives carried out (AlAwadhi & Scholl, 2013). Outputs of Smart governance are considered to be a key element in the analysis of literature on the topic (Meijer & Bolivar, 2015; Ruhlandt, 2018), and authors like (Nam & Pardo, 2011d) understand Smart governance as the promotion of Smart city initiatives. Smart governance should lead to the materialization of the Smart City, as a result of the involvement of stakeholders. Therefore, Smart City implementation should reflect the visions of the different stakeholders.

It can therefore be assumed that narrowing the gap between the stakeholders’ vision of Smart City initiatives and the implementation of this concept through projects will improve Smart City governance and stakeholders’ involvement. This may make a decisive difference to the success of Smart City strategies, as governance is one of the keys for it.

The European Union fostered the Smart City implementation and proposed guidelines for its development through different documents and initiatives. The view of the European Union evolved from a focus on ICT, energy and transportation (The European Commission, 2013) to a more comprehensive and integrated concept, like in the Marketplace of the European Innovation Partnership on Smart Cities and Communities. A strong emphasis has been made on governance. European Union policies on Smart Cities have focuses in strengthening the relationships among stakeholders as the basis for the development and the implementation of the concept (EIP-SCC & European Commission, 2016). One of the roles of the Marketplace is establishing connections among stakeholders and different groups. Cities in the European Union are leading different worldwide commercial rankings on smartness in cities (Cohen 2014; IESE 2016; Networking Society Lab 2016). They are a pole attracting events and innovations in the sector, like the Barcelona Smart City Expo Congress or the EXPO Milan. Different networks of cities have been established like the European Living labs Network or the Marketplace itself. Stakeholders’ involvement is key for the focus of Smart Cities in the European Union. The report “Mapping smart cities in the EU” defined a Smart City as a “multi-stakeholder, municipally-based partnership” (Manville et al., 2014). Therefore, in the context of the European Union, stakeholders’ involvement is especially important.

1.2. Research questions

The definition of the Smart City is something plural that reflects the approaches of different stakeholders to the concept. To understand Smart Cities, it is critical to have clear definitions and a strong conceptual framework. An integrative and holistic approach is needed for this conceptualization, not one based on a traditional sector-based vision.

There are three key elements that should be included in this vision: implementation through projects, challenges and governance agents. Firstly, it is key to understand what is really being done in cities, analyzing the implementation of the Smart city concept through projects, and gathering results in a comprehensive way. Secondly, Smart Cities should be understood as an answer to urban challenges. But cities are not understood as isolated elements, and a regional perspective on urban challenges can help to identify and address them. Third, Governance has a core role in the development of the Smart City. Smart cities must have a multi-stakeholder basis

For successful Smart Cities, good governance, understood as good stakeholder engagement, is critical. For this purpose it is important to bring together their visions of the Smart City and what is really being developed in the initiatives.

It is key to have a regional perspective on it as challenges faces and projects developed in different regions vary. The Smart City concept had an important development in the European Region in the last years, producing policies, city and stakeholders' networks and city strategies. Stakeholders' involvement is a key element for Smart Cities in the European Region. This research will focus in cities in the European region.

This facts, as reflected in the introduction, supported by literature, lead to the main research question of this work:

Are the Smart City strategies materializing the discourses of involved stakeholders in European Cities?

And as a consequence of it, two more questions arise:

How could this be analyzed and assessed?

How could cities in the European Region improve their strategies providing an answer to the visions of stakeholders to increase their involvement?

This research aims to provide an answer to these questions.

It is necessary to compare what is being realized regarding the Smart Cities and the vision of the different involved stakeholders. For this purpose, there is a need of development of analysis

and assessment methodologies. The results of this analysis in different cities can lead to the proposal of measures to reduce the gap between the implementation of Smart Cities and the vision of stakeholders.

1.3. Hypotheses

As an answer to the research question, the following hypothesis is formulated

Smart City strategies are not being able to materialize the discourses and visions of the different stakeholders involved.

Smart City strategies are being materialized by means of Smart City projects. There are different groups of stakeholders (political, economic, social and knowledge agents) that are being involved in Smart City initiatives. These groups have different visions of the Smart City among them. But what is key to this research is that their visions are not coincident with the Smart City implementation through projects.

To reduce the gap between the materialization of the strategies and the different stakeholders' visions would lead to the improvement of governance in the Smart City, improving the chances of success of the initiatives.

As an answer to the different proposed questions, this study will focus on proposing a methodology for analyzing and assessing the capacity of Smart City strategies to materialize the vision of stakeholders. It will propose guidelines for the improvement of the strategies according to different stakeholder's visions as a way of reaching a higher success of Smart City initiatives.

1.4. Objectives

Aligned with the hypothesis, this study has a triple objective:

First, to develop a conceptual model capable of considering the most important topics discussed in this introduction: (a) stakeholders in the initiative, in relation to (b) the projects developed, and (c) the challenges they face;

Second, to use this model to synthesise the opinion of the different agents involved in Smart City initiatives and compare their attitudes to a comprehensive overview of the most relevant projects implemented in a corresponding SC strategy.

Third, to analyze a set of representative Smart Cities in the European Region and extract conclusions and guidelines for Smart Cities in Europe

These are the objectives that will be pursued through the development of this research.

1.5. Methodology and contents

The methodology used in this research takes as a departure point literature research for the development of a conceptual model and its validation. It develops a methodology for its application, combining case studies with interviews and questionnaires. The methodology of the research is described in detail in chapter 5.

This research is structured in 7 chapters. After the introduction explaining the problems and identifying the research gap in Chapter 1, the second chapter introduces the Smart City definitions as a tool to understand the point of view of different stakeholders. It proposes our own Smart City definitions synthetizing the opinion of stakeholders, as a departure point of this research. The third chapter focuses on Smart City conceptual models to define a state of the art on the topic. Chapter 4 contains the definition of the conceptual model and shows the relationship between the different stakeholders and the basic elements and subsystems of a generic Smart City. The aim of this model is to facilitate the analysis of the complex and comprehensive Smart City strategies designed by municipalities from an integrative perspective. Chapter 5 describes the methodology for developing the conceptual model and its application to the case study.

In Chapter 6 the model is used to represent both the implementation (in different stages) of, and discourses on, Smart City strategies. Considering these two aspects –the actual implementation of Smart City projects and the vision of the different stakeholders– it proposes a methodology to extract guidelines to bridge the gap between them. In this chapter the conceptual model is applied to three case studies: Vienna, Milan and Barcelona. These cities represent different levels of complexity according to previous studies. All these three cities present a maturity of their Smart City Strategies, with a high level of implementation and implication of the various stakeholders. Stakeholders involved in the initiatives are interviewed to contrast their visions with the real implementation of the strategy. The research provides information on the strengths and weaknesses of the Smart City strategy developed in this city in different moments of its development. Following this methodology, this section provides guidelines for narrowing the gap between stakeholders' opinions and Smart City implementation in the analyzed cities. It extracts the common points to propose general guidelines for cities in the European region.

Finally, the seventh chapter ends with conclusions about the use of the model and the answer to the research questions. It also explain the scientific results and the possible further steps.

CHAPTER 2. SMART CITY DEFINITIONS ANALYSIS

CHAPTER 2. SMART CITY DEFINITIONS ANALYSIS

This chapter introduces a research on Smart City definitions according to different groups of stakeholders. As explained in Chapter 1, there is no consensus on Smart City definitions. Therefore, this chapter explains of the role of Smart city definitions as expressions of the visions of different stakeholders that define their position, synthetizing their discourses. This definitions are organized by Smart City stakeholders groups, as defined in literature on the topic. As a conclusion, as Smart City definition is proposed. It aims to synthetize the visions of different stakeholders in a comprehensive definition that could be accepted by the different groups. It serves as a departure point for the development of the conceptual model proposed in this research. This work was presented in the Smart City CT conference in Malaga in June 2016 and published in Lecture Notes in Computer Sciences (See Fernandez-Anez, 2016). See annex 6 for the complete documents.

2.1. Smart Cities definitions and discourses

The concept of Smart Cities has been extending since the 90s in parallel with the liberalization of telecommunications and the development of services through the internet. The term Smart City has become in recent times synonymous with extensive use of information technology cities, although a Smart City means much more than that (De Santis et al., 2014).

The first public draft of the Operational Implementation Plan for the European Consortium for Innovation in Smart Cities focused efforts in 3 main fields: energy, mobility and ICT (Manville et al., 2014). But the scientific literature on the subject was already widening the limits of the concept including other topics that are core in the city, as well as integrating them in a holistic approach. The concept of Smart City is not yet statically defined, and thus, in the last years, several scientific articles and papers have been written focusing on the subject. In the scientific literature, the emphasis on social and environmental capital distinguishes the concept of "Smart Cities" of pure technology-centered approaches, and drives the new goals of ICT as a vehicle to promote the objectives of cities from the multidimensional perspective.

At a theoretical level, methodologies that attempt to correlate the basic parameters of the Smart City concept are being developed. Triple Helix methodologies are used to analyze the dynamics of knowledge-based systems, taking into account three pillars: university, industry and government, in a highly related interaction with the concept of Smart City with respect to their global positioning (Leydesdorff & Deakin, 2010).

Which are the discourses of the different stakeholders regarding the Smart City concept? The main objective of this research is to identify and compare the different discourses that stakeholders involved in Smart City projects build around the concept. It will provide

conclusions about the differences and similarities existing among the points of view of stakeholders, providing information that is key to understand the interaction among them. The definition of the Smart City concept has been the key element selected to be analyzed. Being an open concept which does not have a static character, the Smart City definition is being used to establish the conceptual basis that structures the different points of view that stakeholders have about the topic. It includes the main goals and the most important topics and describes the role that technology plays in the approaches of the different stakeholders.

2.2. Methodology for the definitions analysis

The research about the Smart City definition has consisted in the analysis of 32 different Smart City definitions in which 404 terms have been tagged or classified following a methodology that is divided in 3 steps:

2.2.1. Definition of the main stakeholders participating in the Smart City through literature review.

Firstly, the main stakeholders that take part of the Smart City have been defined. Smart city has been identified as a knowledge based system (De Santis et al., 2014) and thus, the model that has been used is the knowledge-based triple helix models. Four stakeholders groups have been defined: academic institutions, private companies and governmental institutions, both at local level and large scale.

Civil society is defined by several authors as one of these groups (Etzkowitz & Zhou, 2006; Lombardi et al., 2011) but it was not possible to find their provided definitions in this study up to this point. Examples of Smart City definitions have been selected through documents produced framed in each of these groups (see table 1).

<i>Academic institutions</i>	<i>Governmental institutions</i>	<i>Local governments</i>	<i>Private companies</i>
Politecnico di Milano, Università degli Studi di Milano (Italy) and VU University, the Netherlands; Institution of Engineering and Technology (UK); Technical University of Lisbon; State University of New York, U.S.; University college, London; Bartlett School of Architecture, London; TEI of Larissa and Aristotle University of Thessaloniki, Greece.	European Commission, Conseil des Communes et Regions d'Europe Council of European Municipalities & Regions, and European Innovation Partnership on Smart Cities & Communities. United Smart Cities, Intelligent Community Forum	European cities: Amsterdam, Barcelona, Zaragoza, Manchester; non-European Cities: Boston, New York, Singapur, and Medellín.	IBM, CISCO, Telefonica, Ferrovial, Indra, Siemens. Boyhugues, GE-Allstom.

Table 1: Reviewed stakeholders' definitions. Source: Fernandez-Anez, 2016

Secondly, a comprehensive literature review has been developed aiming to extract some of the main Smart City definitions provided by some of the most important agents of the previously defined groups. This literature review has taken place in both scientific literature (though specific searchers: Web of knowledge) and in internet (using google). The terms introduced have been Smart City; Smart City definition; Smart City European Union; and Smart City services (for companies). The results appearing in the first three pages of the searchers have been included, trying to achieve a balance among the different groups (See table 1).

A total number of 32 definitions have been selected for their analysis, belonging to the four groups: academic institutions (7), private companies (8) and governmental institutions (5) and local governments (8). The analyzed definitions present different contents and characteristics, as it can be seen in the following tables (See tables 2 to 7).

Academic institution	Definition
Politecnico di Milano, Università degli Studi di Milano (Italy) and VU University, the Netherlands (Caragliu et al., 2009)	“A city is smart when investments in human and social capital and traditional and modern communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.”
Institution of Engineering and Technology (UK) (Harrison et al., 2010)	“A city connecting the physical infrastructure, the IT infrastructure, the social infrastructure and the business infrastructure to leverage the collective intelligence of the city”
Technical University of Lisbon; (Correia & Wünstel, 2011)	“A Smart City in one that is able to link physical capital with social one, and to develop better services and infrastructures. It is able to bring together technology, information and political vision into a coherent program of urban and service improvements.”
State University of New York, U.S. (Nam & Pardo, 2011d)	“[Smart Cities are about] leveraging interoperability within and across policy domains of the city. Smart City strategies require innovative ways of interacting with stakeholders, managing resources and providing services.”
University college, London (Batty et al., 2012a)	“Smart cities are also instruments for improving competitiveness in such a way that community and quality of life are enhanced.”
University college, London (Batty et al., 2012a)	“Cities are becoming smart not only in terms of the way we can automate routine functions but in ways that enable us to monitor, understand, analyse and plan the city to improve the efficiency, equity and quality of life for its citizens in real time.”
Bartlett School of Architecture, London (Haque, 2012)	Any adequate model for the Smart City must therefore also focus on the Smartness of its citizens and communities and on their well-being and quality of life, as well as encourage the processes that make cities important to people and which might well sustain very different – sometimes conflicting – activities.
TEI of Larissa and Aristotle University of Thessaloniki, Greece (L. G. Anthopoulos & Vakali, 2012)	A [smart] city is where the ICT strengthens freedom of speech and the accessibility to public information and services.

Table 2: Definitions by scientific papers elaborated in different Academic institutions. Source: Author’s own elaboration.

Governmental institutions	Definition
European Commission (Manville et al., 2014)	“The idea of Smart Cities is rooted in the creation and connection of human capital, social capital and Information and Communication Technology (ICT) infrastructure in order to generate greater and more sustainable economic development and a better quality of life.”
European Commission (Manville et al., 2014)	“Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership.” Manville et al. 2014
European Commission (Manville et al., 2014)	A Smart City connects human capital, social capital and ICT infrastructure in order to address public issues, achieve a sustainable development and increase the quality of life of its citizens.
Conseil des Communes et Regions d’Europe Council of European Municipalities & Regions (Schweiker, 2010)	EU DG INFSO's definition: a smart city “makes a conscious effort to use innovative ICT based solutions to improve conditions of living and working and to support a more inclusive and sustainable urban environment”
European Innovation Partnership on Smart Cities & Communities. (European Commission, 2012)	Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society.
United Nations (United Nations Commission for Europe (UNECE), n.d.)	The United Smart Cities program was jointly initiated by UNECE and other industrial partners. Key areas are urban mobility, sustainable housing, clean energy, waste management and ICT. Its objectives are as follows: a) Decrease vulnerability of cities to urban migration, demographic changes, environmental degradation and climate change b) Reduce carbon footprint of cities c) Enhance the quality of life for inhabitants d) Improve the environmental quality of the cities e) Establish public-private partnerships (PPPs)

Table 3: Definitions by different Governmental institutions. References with no date are webpages that were consulted in March 2016. Source: Author’s own elaboration.

Local governments	Definitions
Singapur (Infocomm Development Authority of Singapore, 2015)	Sino-Singapore Guangzhou Knowledge City (SSGKC) will be a Smart City, integrating urban management systems, powered by leading information and telecommunication technologies which will drive sustainable economic growth, a high quality of life, and effective management of natural resources. The Smart City will also provide an excellent test bed for leading edge technologies. SSGKC will exploit Next Generation Information and Communication Technology (ICT), cloud computing, and the Internet of Things (IoT) to develop a world class city where residents can live and work in a safe, efficient and resource-efficient environment. The government administration will leverage on ICT technology to optimise the services delivery to residents and enterprises. Note; Citizens don't appear. Stress on technology and efficiency
Boston (City of Boston, n.d.)	Empowered Constituents: Boston is at its best when all constituents have the opportunity to reach their goals. We are a dynamic and vibrant city because of our different backgrounds and experiences and become a stronger community when constituents are encouraged to share their expertise. Engaged City: Boston creates meaningful connections with and between our city's constituents, public, private, academic organizations, neighboring cities, and peer cities world-wide to innovate solutions to our greatest challenges. Efficient Government: A solid foundation is what enables our innovative work. Boston operates as an efficient, open government. We streamline processes, automate information gathering, seek proactive solutions through data analysis, and make infrastructure choices that can adapt to accommodate future changes. Note: Stress in open government and innovation.
Medellín (Alcaldía de Medellín, n.d.)	La ciudad inteligente hace referencia a un modelo urbano basado en la sostenibilidad y la innovación social. Trabajamos para que Medellín se consolide como una ciudad de este tipo, donde los ciudadanos pueden participar en la construcción de un espacio soñada. Participación ciudadana Generar una cultura de la participación a través de espacios adecuados que permitan visibilizar las propuestas de los habitantes, para que tengan un efecto visible en las políticas públicas de la ciudad. Gobierno abierto Generar, promover y posicionar los datos abiertos (open data). La información desarrollada por la Administración Municipal, entes estatales, empresa privada y academia, debe estar disponible para el uso y aprovechamiento de los ciudadanos. Innovación social Los ciudadanos modifican su entorno, transforman sus realidades de forma autónoma para encontrar soluciones a la medida de sus problemas. Fomentamos este tipo de innovación que busca el bien común, la cooperación y la inclusión. ¿Cómo hacer que algo perdure en el tiempo? La sostenibilidad nos habla de asegurar unas condiciones económicas, ambientales, políticas y sociales para las generaciones actuales y futuras.
Manchester (Manchester City Council, n.d.)	MDDA is involved in a range of open innovation projects that are working to make Manchester a Smart City through the Manchester Living Lab, supported through a range of EU programmes. The projects include involving citizens in testing energy management systems through smart meters, working with government agencies to open up data, developing a next-generation access fibre based digital infrastructure and working with local residents to equip them with the skills to support the co-production of new community services.
Amsterdam (Amsterdam City, n.d.)	Amsterdam Smart City (ASC) is a unique partnership between businesses, authorities, research institutions and the people of Amsterdam. Together, our goal is to develop the Amsterdam Metropolitan Area into a smart city. A city is smart when investments in capital and communication infrastructure fuel sustainable economic growth and a high quality of life, in combination with an efficient use of natural resources. Over the past three years, the Amsterdam Metropolitan Area has worked successfully to become a Smart City

Table 4: Definitions provided by local governments (continues in table 4). References with no date are webpages that were consulted in March 2016. Source: Author's own elaboration.

New York (Ringnes, 2014)	Smart cities: Use the intersection of people, technology, and data to predict, rather than react to, the future's demands. Invest in creating new ways to improve efficiency in their use of resources. Through the use of information and innovative communication technologies they implement solutions that result in cost and energy reduction, improved service delivery, reduced environmental footprint and support for the low-carbon economy.
Barcelona (Ayuntamiento de Barcelona, 2014)	A smart city improves quality of life for its citizens across the whole of society, a sustainable and self-sufficient city nourished by innovation and new technology, essentially with these three main criteria: efficient management of services & resources, new tools and places for people, groups & institutions to interact with each other, use and integration of new technologies (ICT)
Zaragoza (Ayuntamiento de Zaragoza, n.d.)	Zaragoza articula su estrategia de Gobierno Abierto en torno a cuatro ejes principales: Vínculo Digital, reforzando los lazos de la ciudadanía con la ciudad, abriendo canales nuevos de comunicación y ampliando la utilización de las nuevas herramientas tecnológicas. Servicios públicos abiertos, con la eficiencia y el compromiso de servicio como motores, en línea con el concepto de Ciudad Abierta y a la altura de la nueva ciudadanía, cada vez más digital, exigente y participativa. Industrias digitales, porque constituyen un campo de actividad económica clave para nuestra competitividad y cuyo peso en el crecimiento debe potenciarse si queremos tener más y mejores empleos en el futuro. Ciudad inteligente, promoviendo un modelo propio que sitúa al ciudadano en el centro, abriendo espacios de trabajo a múltiples agentes y facilitando la creación de soluciones por terceros

Table 5: Definitions provided by local governments (continues table 4). References with no date are webpages that were consulted in March 2016. Source: Author's own elaboration.

Siemens (Siemens, n.d.)	Technologies are major levers for sustainable city development. Effective infrastructure contributes to economic prosperity and an improved quality of life. The complexity involved requires both a holistic view and sustainable solutions. Siemens has the portfolio, know-how, and consulting expertise to make cities more livable, competitive and sustainable.
CISCO (CISCO, n.d.)	As world populations migrate to urban areas, cities are faced with new challenges. These may include traffic jams, overcrowding, pollution, resource constraints, inadequate infrastructure, and the need for continuing economic growth. Cisco Smart+Connected Communities solutions can help city leaders address these problems using intelligent networking capabilities. The solutions can provide the information and services needed to create more livable cities, and help them thrive.
IBM (IBM, n.d.)	Smarter cities of all sizes are capitalizing on new technologies and insights to transform their systems, operations and service delivery. Competition among cities to engage and attract new residents, businesses and visitors means constant attention to providing a high quality of life and vibrant economic climate. Forward-thinking leaders recognize that although tight budgets, scarce resources and legacy systems frequently challenge their goals, new and innovative technologies can help turn challenges into opportunities. These leaders see transformative possibilities in using big data and analytics for deeper insights. Cloud for collaboration among disparate agencies. Mobile to gather data and address problems directly at the source. Social technologies for better engagement with citizens. Being smarter can change the way their cities work and help deliver on their potential as never before.

Table 6: Definitions provided by private companies (continues in table 7). References with no date are webpages that were consulted in March 2016. Source: Author's own elaboration.

Indra (Indra, n.d.)	Estos nuevos retos afectan de forma transversal a distintos ámbitos de la ciudad, por lo que su solución debe abordarse con una visión integrada e innovadora desde todas las perspectivas y áreas clave de la misma. Para superar estos retos, las ciudades deben evolucionar hacia un modelo de gestión de mayor calidad y eficiencia que permita: Consolidar el crecimiento de la ciudad y permitir una evolución flexible y ordenada. Proporcionar a los ciudadanos servicios de mejor calidad y de manera más eficiente con un menor coste, de modo que se pueda lograr una administración sostenible. Obtener una visión integrada de todos los ámbitos de la ciudad de manera que se obtengan sinergias y ahorros operativos.
Telefonica (Telefónica, n.d.)	Smart cities for a better world. The cities of the future will be safer, more sustainable, efficient, comfortable and interactive. They will be an urban environment that is permanently communicating with the citizens and capable of managing public services in real-time to improve their quality of life through traffic management, garbage collection, irrigation systems, alerting the local authority when an incident occurs and allowing the government to stay in touch with the people. m2m technologies allow for the collection and transmission of information helping us to make more intelligent decisions. BENEFITS. Why a Smart City is a better city. Better decisions Gaining optimisation and sustainability. Improving quality of life.
Boyhugues (Boyhugues, n.d.)	The "smart cities" modern and sustainable cities emerging. Always more efficient, comfortable and connected, infrastructure and key services must be increasingly flexible , interactive , and effective , in a social and environmentally sustainable .
GE-Allstom (GE-Allstom, n.d.)	A Smart City or Eco City is a new concept of transversal optimisation to deliver energy, water, transportation, public health and safety, and other key services to empower cities to better run and control critical infrastructure operations while providing a clean, economic and safe environment to the people.

Table 7: Definitions provided by private companies (continues table 6). References with no date are webpages that were consulted in March 2016. Source: Author's own elaboration.

2.2.2. Definition of the key issues to classify the Smart City concepts: Smart City action fields, Smart city main goals and technological approach. These key issues have been defined through the analysis of the existing literature on the topic (Fig. 1).

Figure 1: Smart City concepts in which the analyzed terms have been classified. Source: author's own elaboration.

On a first step, the Smart City projects have been divided into the six main fields that Smart City strategies are considering in the city: *governance, economy, environment, mobility, people and living* (Rudolf; Giffinger et al., 2007). This classification has been chosen being the most used

in the literature by different authors and adopted by the European Commission in the report Smart cities in the “Mapping Smart Cities in the EU”.

A second step consisted in identifying the main goals of the Smart City, which have been synthesized into three main goals: *sustainability*, *quality of life* and *efficiency* (Perez-Prada, Fernandez-Anez, & Velazquez-Romera, 2015).

Technologies play a key role in the development of the Smart City, but there are different points of view about the role technology plays in the city. It can be seen as a *tool*, as a way of *connection* or as a goal, and it is seen whether as a wide concept including every kind of *technology* used within the city, or reduced to the use of *ICT*, even sometimes just as the management of *information*.

2.2.3. Analysis of Smart City concepts through text analysis techniques. The Smart City definitions have been studied using text analysis tagging techniques, a methodology frequently used in social sciences research. Definitions were analyzed using a variation of Term frequency (tf) analysis.

A total number of 404 terms have been extracted from the 32 definitions and analyzed. Some of them appear several times. The terms are all the words of the analyzed definitions excluding articles and connectors (excluding words that did not bring new significances to the definitions: the, from, if, besides, etc). The following tables show the variety of terms identified. (See tables 2, 3 and 4).

Term weights are used in automatic text categorization combined with other frequency factors (Erenel & Altınçay, 2012; Lan & Su, 2007). According to Salton & Buckley (1988) the number of times a term appear in a document closely represents the content of the document, setting the basis of most search engines. We will adopt for representation the raw term frequency (rf) in the definitions, being the most popular form of representation (Man Lan, Chew Lim Tan, Jian Su, & Yue Lu, 2009).

A manual methodology has been implemented, using excel tables to classify the main words in the definitions to obtain the first outcomes.

Regarding the hierarchy of terms, all terms have been given the same weight. They have been analyzed separated according to their belonging to action fields, goals of the Smart City, visions of technology, and finally a mixed group of other terms. All terms have the same value within their group and each of the four groups, being analyzed separately, have an identical value.

governance	plan, participatory governance, political vision, services , transparent , urban management, responsive, municipally based partnership, address public issues, citizens, management of services, government agencies, open government, Change public procurement, Citizen involvement and recognition, service delivery, legacy systems, among agencies, administration, allowing government to stay in touch with the people, helping more intelligent decisions, better decisions, policy domains of the city, services, open public services, service compromise, for its citizens, citizens, administrative renewal, eAdmin, Mobile administration, integrated communication infrastructures, better infrastructures, leaders, managing public services in real time, accessibility, freedom of speech, make cities important to people, on-line relationship with the citizen, new citizenship, more digital, demanding and participative.
economy	competitiveness, business infrastructure, financing, sustainable economic development, economic needs of society, sustainable economic development, business, capital, digital industries, economic activity fields key for competitiveness, more and better future employments, business incubators, economic prosperity, economic growth, competition, businesses, Vibrant economic climate, tight budgets, scarce resources, reduced costs, sustainable economic growth, free technology transfer to SME's, synergies and operative savings, managing resources
environment	wise management of natural resources, physical capital, physical infrastructure, urban planning , natural resources, energy efficiency, water, cleaning, pollution, lack of resources, garbage collection, irrigation systems, better infrastructures, flows of energy, materials, urban improvements, urban environment, urban environment, managing resources
mobility	Mobility, traffic jams, infrastructure, traffic management,
people	community enhancing, human capital, social capital, social capital, communities, social infrastructure, systems of people, social needs of society, human capital, social capital, human capital, social capital, people, new tools & places for people, interactions, involving citizens, community services, citizenship, inclusion actions , citizen, Citizen involvement and recognition, overcrowding, new residents, comfortable, citizens managing resources, freedom of speech, make cities important to people, , on-line relationship with the citizen, new citizenship, more digital, demanding and participative, accessibility, Advanced training and open innovation services, sustain different activities, leverage the collective intelligence of the city, citizens, social
living	services, better services, service improvements, providing services, conditions of working, conditions of living, visitors, citizenship services, city services, safer, alerting local authority when an incident occurs, services, Open public services, service commitment, sustain different activities

Table 8: terms related to the Smart City action fields. Source: author's own elaboration.

Regarding the action fields, analysis provides an overview of the different terms used to make reference to the categories defined (*governance, economy, environment, mobility, people and living*) (See Table 8). In the analyzed definitions, *governance* is mentioned not only as the term itself, but also referenced through elements that configure governance systems (citizens, stakeholders, leaders, government, agencies); general issues of local governments (public services and administration, management of public issues, policy, infrastructures) and elements that are key in the definition of Smart Governance (transparency, participation, openness,

accessibility). Participation and citizen(ship) focused approaches are also very important in definitions that include the *governance* topic.

In the *economy* action field, the main identified terms are the ones regarding sustainable economic development, or even growth. Some of them directly address economic prosperity and growth avoiding mentioning sustainability, and some of them focused on competitiveness. Some speak more about savings, resource management and their scarcity, adapting the Smart City definition to the current economic situation. Financing, capital, industry and employment also appear in the definitions, but are not frequently mentioned.

Environment is reflected in the definitions mainly as resources management (energy, materials or waste, but also as the lack of resources), infrastructures and also through urban planning, urban environmental and urban improvements. *Efficiency* also appears when the resources management is referenced as “wise”.

Mobility is the topic that groups a smaller amount of terms, only mentioned in terms of infrastructure and traffic management.

People concept appears both as a group of individuals (people, citizens and human capital), but also as society, grouped in communities, collective intelligence, social infrastructure and social capital. Systems and relationships between them are also referred in a passive way as services (which belongs mostly to the *living* concepts) but in an active way through concepts like inclusion, involvement and accessibility.

The terms related to *living* are associated to services, improvements and openness, to conditions of working and living and to the variety of activities to be sustained by the city.

sustainability	resiliency, sustainable development, sustainable, sustainable eco-growth, holistic view and sustainable solutions, more sustainable, sustainability, flows of energy, materials,
quality of life	quality of life, well-being, high quality of life, improved quality of life, livable,
efficiency	efficiency, efficiency by means of privatization, help deliver on their potential as never before, optimization, synergies and operative savings, operative synergies, wise management, better, improve

Table 9: terms related to Smart City goals. Source: author’s own elaboration.

Goals of the Smart City are more explicitly mentioned and therefore have a smaller number of associated terms (Table 9). *Sustainability* appears in a large number of definitions, being frequently mentioned associated to the terms “development” and “growth”. *Resilience* also appeared in one of the definitions, widening the concept. The concept of *quality of life* appears mostly alone, but also linked to its improvement and to more livable cities. As a part of quality

of life, well-being is also mentioned in the analyzed definitions. When not directly mentioned, *efficiency* appears through the mention of improvements and wise management.

The technology concepts embedded in Smart City definitions are sometimes linked to the concept of *ICT* (Table 10). This concept mainly appears associated to infrastructure and networks, but is also used as a key metering element of the Smart City. A set of terms is related to *connection*, whether as an integration (integrative, global, transversal, bringing together, including several perspectives...) or as interaction (producing synergies, engaging...). There is also a group of terms that shows a wider understanding of technology within the Smart City. This wider understanding includes the general term, *technology*, but also other options (m2m, eAdmin, Social technology, digital infrastructures and Open data...) that can include ICT or not as a part of them. Technology is also understood as a *tool* that in the Smart City framework strengthens, instruments, fuels or catalyzes resources to reach the Smart City objectives.

ICT	ICT, automate routine functions, in real time, traditional and modern communication infrastructure , technology, IT infrastructure, ICT infrastructure, ICT based solutions, smart meters, networking capabilities, mobile, information and communication infrastructure
Connection	link, bring together, coherent program, interoperability within and across, interacting, interacting with, flows and interactions, connection, connects, digital connection, new communication channels, engage and attract, collaboration, gather, engagement, transversal, integrated vision, global approach, integrated approach, transversal, interactive, permanently communicating, collection and transmission of information, synergies and operative savings, operative synergies, from all points of view and key areas, access/connectivity
technology	new technology, digital infra, Application Store, open data, cloud, technology implementations, m2m technologies, launching and fostering the use of new technological tools regarding the city, social technologies, free technology transfer, administrative modernization, mobile administration, eAdmin, integrated communication infrastructures, technological-managerial model.
tools	strengthens, instruments, Investments in human, social, ICT fuels sustainability and governance, using, to catalyze , become smart through, work, strategic use of information and communication infrastructure, launching and fostering the use of new technological tools regarding the city
information	Information, public information, Open City concept, address problems directly at the source, big data and analytics, data

Table 10: terms related to technology concepts in Smart City definitions. Source: author's own elaboration.

There are also other terms that cannot be included in the earlier groupings, but that also appear included in the definitions (Table 11). They have been classified into 7 groups: *innovation*, *equity*, *analysis*, *stakeholders*, *change and management*. This way, all the terms appearing in the 33 analyzed definitions have been classified.

innovation	innovative, research institutions, innovation, open innovation, competitive, innovative, forward thinking leaders, new and innovative technologies, Innovation, investment,
equity	equity, inclusive, accessibility
analysis	monitor, understand, analyze, big data and analytics
city	city, cities, Smart City, City challenges, better city, urban improvements, urban environment, city subsystems
stakeholders	stakeholders, multi-stakeholders, Public-Private partnership.
change	process, quality, quality of life, smart, stakeholders, sustainability
management	operation, management model, flexible organized evolution, decisions, responsibility, management, services and processes, managing public services in real time, technical-managerial model

Table 11: other topics in analyzed Smart City definitions. Source: author's own elaboration.

2.3. Definitions by stakeholders

In a first stage of this research, definitions from a first selection of stakeholders have been analyzed separately (Fig. 2).

Figure 2: Classification of terms in academic Smart City definitions. Source: Fernandez-Anez, 2016.

2.3.1. Smart Cities from the point of view of Academia. (See Fig. 3) Among the concepts that appear in the academic papers, the ones related to people present a higher number of mentions. Concepts related to *people* are the key element in Smart Cities, appearing in 6 of the 8 definitions analyzed, appearing in several occasions. “Mobility” does not appear as a topic in any of the analyzed definitions.

Figure 3: Classification of terms in academic Smart City definitions. Source: author’s own elaboration.

Regarding the goals of Smart cities, to reach a higher *quality of life* is highlighted as their main objective (5 terms). *Efficiency* and *sustainability* are each mentioned in just one of the analyzed definitions. It is possible to conclude that in these kinds of definitions the focus is on processes more than on outcomes.

The Academia’s approach to technology is mainly focused on *ICT* (7 times mentioned). Technology is also understood as a *tool* (3 times) for *connection* (6 times) within the city. For the academic institutions researched, urban and city concepts are the only ones slightly outstanding among the other concepts included in the classification.

2.3.2. Smart City approaches by Governmental Institutions. (See Fig. 4) Concepts related to *governance* and *environment* are the main ones highlighted by the analyzed definitions of Smart Cities provided by institutions. They are followed in number by concerns about *people*. The city as a services provider, in the *living* action field, does not appear to have a key role in the definitions provided by Inter-governmental institutions. *Economy* appears to be less important, becoming the social aspect the part of sustainability enhanced in these definitions. Finally, *mobility* appears just once.

Figure 4: Classification of terms in Smart City definitions provided by Governmental Institutions. Source: author's own elaboration.

The main goal of Smart Cities, as described by inter-governmental institutions analyzed definitions, is related to the enhancement of more *sustainable* cities, but besides *quality of life* also appear to have a key role in Smart City definitions. Concepts related to *efficiency* do not have any relevance in the definitions proposed by the Inter-governmental entities.

Definitions of Inter-governmental entities do not consider *technology* from a wide point of view to become as part of the Smart City, but understands *ICT* as the main technological element to be considered. Supporting this focus in *ICT*, its role as a *connection*, becoming a *tool* in the approaches of 4 of the definitions and not and objective itself.

Innovation, *equity* and *stakeholders* are other terms mentioned in this set of definitions.

2.3.3. Local governments and Smart Cities. (See Fig. 5) Local governments Smart Cities definitions are mainly focused on concepts related to *people* (society and citizenship), even though governance concepts also play a key role. Other aspects of sustainability (*economy* and *environment*) appear mentioned in a smaller number of occasions. *Mobility* is mentioned in only one of the analyzed definitions.

Figure 5: Classification of terms in Smart City definitions provided by Local Governments. Source: author's own elaboration.

Local governments' approach of Smart cities is almost equally driven by the goals of *sustainability*, *quality of life* and, mainly, *efficiency*. But it is also important to highlight that the definitions local government provide are not highly focused in the objectives, but in the elements that compose a city and in the citizens that inhabit it.

Local governments definitions have a wider perspective of *technology* within the city, mentioning any type of technology as key for a city to become Smart. Despite this fact, *ICT* also appears in 4 of the 8 analyzed definitions. The use of technology and ICT as a *tool* is appearing a smaller number of times than in the definitions previously analyzed. *Innovation* for local governments is a key topic, appearing in 6 of the 8 definitions and being as important as technology, and even being a substitute of this concept considering technology to be the element behind the term of innovation.

2.3.4. Private companies defining Smart Cities. (See Fig. 6) Concepts related to *governance* are the most highlighted by private companies among the ones referring to the different action fields. *Economy* and *environment* terms appear in 7 of the 8 analyzed definitions, being also an important element. Terms related to *people* and services that can be provided (*living*) do not play an important role. *Mobility* appears as a topic in the half of the analyzed definitions. The goals are mostly focused on *efficiency*, which appears in all definitions, but *sustainability* and *quality of life* also appear in 7 and 6 of the analyzed definitions respectively.

Figure 6: Classification of terms in Smart City definitions provided by Private Companies. Source: author's own elaboration.

In the previous analyses the most important concepts were *people* or *governance*, included in the action fields. However, in the Smart City definitions provided by private companies, the term that is mentioned a higher number of times is a technological one. *Connection* is the most important aspect highlighted by Private companies in their definitions. *ICT* only appears in two of them, not limiting the scope of private companies to a type of technology. It is important to highlight that technology is not understood as a *tool*, this concept only appearing in one of the analyzed definitions.

The definition of the Smart City they provide emphasizes the *city*, the urban aspects. They define the Smart City from the point of view of providers of *management* solutions aiming to improve the efficiency of the city, and present a strong relationship with the local governments' definitions. *Innovation* is also important, appearing in 5 of the 8 analyzed definitions and being mentioned more than once in some of them.

2.4. Comparative analysis

The final step is to compare the results of the semantic analysis of the Smart City definitions provided by Universities, Institutions, Local Governments and Private Companies. These comparisons aim to help understanding the differences and the common approaches among the different stakeholders taking part in the Smart City.

Figure 7: Distribution of concepts among the analyzed aspects. Source: Fernandez-Anez, 2016

Classification of topics (Fig. 7) is distributed in a similar way in the definitions of Academia, Institutions and Local Governments paying special attention to the action fields, composed of more elements and thus of more terms. Private companies' definitions include a more balanced approach to the topics. In their definitions, the focus is not on action fields but more in other concepts.

Figure 8: Comparison among approaches regarding Smart City action fields. Source: Fernandez-Anez, 2016

Secondly, key words have been classified into the defined Smart City dimensions (*governance, economy, environment, mobility, people and living*) (Fig. 8). Regarding the definitions provided by Academia and Local Governments, *people* is the Smart City action field that is mentioned more times. The analyzed definitions of Inter-governmental Institutions focus in *environment, governance and people*, while for private companies, *governance* concepts play a major role, followed by the *economy* and environment. *Environment* is not such an important element, even if it is the focus of great investments and the concepts of the initial definitions of Smart City where highly related to this field (Manville et al., 2014). *Mobility* appears mainly in the discourses of companies, and it is mentioned once in definitions of Academia and Local governments.

Figure 9: Comparison among approaches regarding Smart City action fields. Source: Fernandez-Anez, 2016

Regarding the main goals of the Smart Cities (Fig. 9), in analyzed academia definitions, the *quality of life* is the most important objective of a Smart City, while governmental institutions state that *sustainability* is the key goal of a Smart City, followed by *quality of life*. Local Governments and Private Companies focus on *efficiency* as the main issue that the Smart City

concept should address, local governments having a slightly more balanced vision of the goals of the Smart City. *Efficiency* does not play a key role on the definition of the Smart city provided by institutions, and has the same importance as *sustainability* for Universities.

Figure 10: Comparison among approaches regarding technology in Smart City definitions. Source: Fernandez-Anez, 2016

In definitions of Academia and Governmental Institutions, a Smart City is defined by the use of *ICT*. (Fig. 10). Regarding *technology*, *connection* is the principal issue for them. On the other hand, Local Governments and Private Companies approaches to *technology* are wider and include many other possibilities. Understanding technology as a *tool* to reach the Smart city goals does not appear as an important issue to Local Governments and Private Companies, but is one of the main approaches presented by Institutions.

2.5. Conclusions. Defining Smart City: a cooperation and agreement of stakeholders.

One of the basis of the Smart City concept as defined by the European Commission (Manville et al., 2014) is to be a “multi-stakeholder, municipally based partnership”. The approach of the different stakeholders vary in terms of selection of field in which to act, objectives and their point of view about technology. Only understanding the differences and providing guidelines for the connection of the different stakeholders to include all points of view will it be possible to get the holistic approach that is essential to the Smart City, providing this multi-stakeholder partnership. A comprehensive definition that involves all the approaches must be established.

To achieve this consistent definition multiple stakeholders have to be involved in the smart city but local government has the role of coordinating the central concept. Local government analyzed definitions, when compared in the analyzed fields, show a close approach between the objectives of municipalities and the ones of private companies. This can seem obvious regarding the customer-provider relationship they have given that private companies are being better able to understand local government’s needs, but it poses two questions. First of all, it is not clear who is influencing whom and remarks the danger of municipal investments being driven by market interests. But it also highlights the challenge that Academia and Inter-governmental institutions must face in better understanding which are the real needs of municipalities.

Meanwhile, there are important similarities among the definitions provided by universities and inter-governmental institutions, presenting a wider point of view that places the citizen and the *quality of life* in the center of the Smart City concept. In the analyzed definitions, all stakeholders focus on *governance* and *people* as the main action fields in which a Smart City must be based and focus on, leading to citizen centric approaches.

Results also show independence between the results of Academia and Inter-governmental institutions and the ones of private companies in all the analyzed fields.

However, regarding technology, the definitions of these three groups of stakeholders understand connection as key, while municipalities' definitions express a wider need of technology implementation and is thus not so focused in the idea of integration.

As a conclusion, a definition is provided which aims to set the basis for future works in the field of Smart cities (Fig. 11):

A Smart City is a system that enhances human and social capital wisely, using and interacting with natural and economic resources via technology-based solutions and innovation. It aims to address public issues and efficiently achieve sustainable development and a high quality of life on the basis of a multi-stakeholder, municipally based partnership.

This definition includes the main action fields (governance (multi-stakeholders, municipality), economy, environment, people and living (services and public issues)). Technology appears in the definition following the wide idea of analyzed municipalities' definitions, but also as a tool for connection and in a wide perspective that include several kinds of technologies. Innovation is an important vector mentioned by definitions by all groups of stakeholders. Finally, the goals of the Smart City (Sustainability, quality of life and efficiency) must be included in a balanced way.

Figure 11: Proposed Smart city definition

This research has a limited scope including only a small part of existing definitions, and will be extended by automatizing the research through software to reach a wider number of definitions. However, some guidelines for the future are already suggested by the results.

Firstly, tools for assessment are necessary to enhance a balanced implementation of Smart City strategies and initiatives, especially tools that allow local governments and local decision makers to trace the guidelines for the development of their cities if they are supposed to lead the way to a smarter city. This approach would avoid a strong influence of market interests driving municipal investments.

Another conclusion is that to get the citizen centric approach that can be extracted from definitions, awareness and participation should be enabled. Creation and promotions of the visions of civil society and citizenship should be enabled.

Besides, inter-governmental institutions must be able to reach municipalities in order to materialize their policies. Economy plays a key role for municipalities according to this analysis. Financing provided according to criteria of Governmental Institutions like UN or EU through their financing entities (World Bank, European Investment Bank) can play a key role in the development of Smart Cities through the projects they support, getting a more balanced approach to the Smart City concept aligning local projects with policies that these institutions develop.

Finally, a close research about municipalities and their needs can help to align Academia objectives with the ones of municipalities, helping to improve the benefits that research can have in the whole society, in a world that is increasingly urbanized.

CHAPTER 3. STATE OF THE ART

CHAPTER 3. STATE OF THE ART

In this chapter presents a state of the art on the topics of this research. It is divided into two main elements that are relevant for this work. The first is Smart City conceptual models. It is an extended version of the State of the art of the article “Smart City implementation and discourses: An integrated conceptual model. The case of Vienna.” published in the scientific journal “Cities” (See Fernandez-Anez et al. 2017). The second one is Smart City assessment. It is an extended version of the article “Smart City Projects Assessment Matrix: Connecting Challenges and Actions in the Mediterranean Region.” published in the Journal of Urban Technology (Fernandez-Anez et al. 2018). (See annex 6)

3.1. State of the art on Smart City Conceptual models

Conceptual models have been used in scientific literature to represent ideas in a visually simplified way. Conceptual models can be understood as an abstract representation of a system (either social or physical) through concepts (Barsalou, 2005; Lakoff, 1994). A conceptual model focuses on certain aspects of reality (Brown, 2006). It aims to facilitate the understanding of the represented systems and their simulation (Barsalou, 2005).

In recent years, a range of conceptual approaches to the Smart City have led to different interpretations and thus to differences in its conceptualization.

Some authors have used the triple helix conceptual model (Deakin, 2014; Etzkowitz & Zhou, 2006; Lombardi et al., 2011) to understand the role of the stakeholders in the Smart City. The triple helix was used to examine the knowledge base of urban economies, and Leydesdorff & Deakin (2010) proposed it as an instrument to study the meta-stabilising potentials of urban technologies in Smart Cities. The work of Lombardi et al. (2011) expanded its scope to include civil society in a modified triple helix (Fig 12), and a subsequent work (Lombardi, Giordano, Farouh, & Yousef, 2012) crossed this concept with five city clusters (Governance, Economy, Human Capital, Living and Environment). These relations are used to structure an analysis of interrelations within the Smart City and to extract guidelines for policies.

Figure 12: Author’s vision of the triple helix model (left) and visualization of the proposal of Lombardi et al., (2012). Sources: author’s own elaboration (left) and Lombardi et al., (2012).

Nam & Pardo (2011b) conceptualized the Smart City in a model that combined institutional, technological and human factors (Fig 13, left). They applied the model to formulate strategic guidelines for the success of Smart City initiatives. To explore these concepts further, some researchers (Chourabi et al., 2012) increased the complexity of the model. In their proposal, they placed Smart City initiatives at the core. They identified a set of internal factors that affected the Smart City more directly: Technology, Organizations and Policy. The external factors (Governance, People and Communities, Natural Environment and Infrastructures) were on a second level of impact. The purpose of this model was not only to explain the Smart City concept but also to develop a tool to analyze the proposals of local governments and extract guidelines for practitioners and researchers.

Figure 13: Conceptual models proposed by Chourabi et al., (2012) (left) and Dameri (2013) (right). Sources: referenced papers.

The proposal of Dameri (2013) (Fig. 13, right) highlighted the need for a theoretical approach for a concept (Smart City) developed from empirical experience, and included a multiscale focus on the goals of the Smart City rather than on the means to attain these goals. It placed a set of basic Smart City components (Citizens, Land, Technology and Governance) at the core. The spatial level was the next step, as the multi-scale scope was considered essential for the Smart City, with different influences at the city, regional, city network, national and global scales. Finally, the model proposed a third level with the goals of the Smart City, defined as Environmental Sustainability, Quality of Life and Wellbeing, Participation, and Knowledge and Intellectual Capital. The model sought to support local governments and public administrations in the implementation of Smart City initiatives focusing on these ultimate goals.

In the attempt to represent the transversal and integrative character of the Smart City concept, matricidal models have been developed. This kind of operational models is developed by standards organizations, and they have been followed by cities organizations and local

governments. The model proposed by the British Standards Institution (British Standards Institution, 2014) crossed the urban sectors (Fig. 14) (energy, water, transport, health) with different steps to the final objective, the customer delivery. From technology and infrastructure to data, later to governance and to services, and finally reaching the customer. It distinguished externally and internally driven innovation. Governance could be understood as placed at the center, but in the sense of technology management (technology and digital assets, business and services). The view of stakeholders is a variety of universities, start-ups, SMEs, social entrepreneurs, charities and community groups.

Figure 14: Conceptual models of the British Standards (up) and the Scottish alliance (down). Sources: (British Standards Institution, 2014; The Scottish Government, Scottish Cities Alliance, & Urban Tide, 2014)

Other entities, like the Scottish Cities alliance (The Scottish Government et al., 2014)(Fig.14), have taken this vision as a departure point to develop their roadmap for smart cities. They incorporate the vision of steps, but instead of technology they take the strategic intent as a departure point understanding technology as a tool. The initiatives evolve through different phases to arrive to a final step that is stakeholders' engagement.

The model proposed in the initiative Barcelona Smart City (Ayuntamiento de Barcelona, 2014), also includes vertical "silos" (ICT, water, energy, etc.) and horizontal elements like Open government, public and social services, infrastructures, City scale and environment (Fig. 15). However elements in these two directions are not overlapping or crossing.

Figure 15: Conceptual model for the Barcelona Smart City initiative. Source: Ayuntamiento de Barcelona, 2014.

The ASCIMER Project Team also developed a model for their research as a result of experiences in Smart City projects (Fig. 16). Based on the work of Giffinger et al. (2007), the model understands the Smart City as the confluence of the dimensions of "Governance", "Economy", "Environment", "Mobility", "People" and "Living" articulated by ICT and technology tools (Monzon, 2015), and proposes a classification of Smart City projects and their integration through a comprehensive and integrative approach (Fig. 16). This Smart city core appears surrounded by a set of urban challenges that are linked to the different dimensions. It is a model developed for the Mediterranean Region, but it distinguished between two areas that are facing different challenges: the north Mediterranean and the south and east Mediterranean. It connects

Figure 16: Model proposed by the ASCIMER project (Monzon et al, 2015)

the challenges of both areas to show that the way we solve challenges can lead to future problems.

Recent conceptual visions of Smart Cities have focused on governance as the key issue for the success of the initiatives (Meijer & Bolivar, 2015). Conceptual models such as the proposal of Castelnovo et al. (2015) (Fig. 17) reflect this point of view and propose a citizen-centric approach to Smart governance, placing “Community Building and Management” at the center of the model. This concept involves four additional dimensions (Vision and Strategy Formulation, Public Value Generation, Asset Management, and Economic and Financial Sustainability), and proposed an integrative approach to the assessment of urban participatory policy-making.

Figure 17: model proposed by Castelnovo et al. (2015).

Finally, the work of Fernández-Güell et al., (2016) proposed an approach to cities based on systems theory (Fig. 18). It places urban demand at the core of the system, surrounded by four subsystems (societal, economic, political and environmental). The city exists in response to the spatial subsystem, including different infrastructures and facilities, and a technological subsystem that supports this spatial subsystem. At another scale, economic, societal, technological and geopolitical changes affect the city and modify the system. The paper conceives the model as a forecasting tool for describing present and future scenarios.

Figure 18: model proposed by Fernández-Güell et al., (2016).

The findings in regard to the conclusions and gaps in these conceptual models have been organized into three topics: (a) stakeholders and governance, (b) identification of projects and dimensions, and (c) relationship with urban challenges.

The evolution of the models reflects the growing importance of governance, the shift to citizen-centric approaches (Castelnovo et al., 2015; Dameri, 2013; Fernández-Güell et al., 2016), and the key role assigned to stakeholders (Dameri, 2013; Fernández-Güell et al., 2016; Leydesdorff

& Deakin, 2010; Lombardi et al., 2011). This does not necessarily mean that there is a change in the governance models, which in some proposals are still top-down focused under the idea of city management for service delivery (Ayuntamiento de Barcelona, 2014(British Standards Institution, 2014)) even if in further development of the contents of the model the idea of bottom-up governance is expressed. Despite the growing importance of governance, in the models analyzed this cluster has the same importance as other clusters and dimensions (Chourabi et al., 2012; Dameri, 2013; Lombardi et al., 2012; Monzon, 2015), and sometimes takes a central role (Dameri, 2013) or is understood as an external factor (Chourabi et al., 2012). However, the relationships established between the elements of the different models can be implicitly understood as reflecting governance. Stakeholders play a central role in the work of Leydesdorff & Deakin (2010) and Lombardi et al. (2011), but their analysis focuses mainly on the weighting of indicators rather than on a deeper analysis of the discourses (Lombardi et al., 2012). Stakeholders are mentioned in a more generic way in other conceptual models, as “citizens” (Dameri, 2013), “organizations” (Chourabi et al., 2012), and in concepts such as “community building” (Castelnovo et al., 2015), and do not even appear in some models (Monzon, 2015). Fernández-Güell et al. (2016) started a classification of demand that is closer to the work of Lombardi et al. (2011).

The focus on governance is combined with the focus on real projects organized into different dimensions (British Standards Institution, 2014; Chourabi et al., 2012; Fernández-Güell et al., 2016; Lombardi et al., 2011; Monzon, 2015; The Scottish Government et al., 2014). Most of the models analyzed include clusters and dimensions that help classify not only Smart City objectives but also their initiatives and projects. The exception is the work of Dameri (2013), which directly presents only the objectives. In most cases these clusters appear as separate groups (Chourabi et al., 2012; Fernández-Güell et al., 2016; Lombardi et al., 2012) or focused on one area (Castelnovo et al., 2015), but the relationships between them are identified and reflected. These clusters only overlap in the case of Monzon (2015), which can be seen as a step towards integrating the elements in the model.

The work of Dameri (2013) and Fernández-Güell et al. (2016) highlights the need for a multi-scale perspective to include the inputs, scope and impacts of the projects and their effects on urban challenges. However, the Smart City is not considered as an answer to urban challenges in most of the models, but related to the goals identified by Dameri (2013) and Castelnovo et al. (2015), and linked to the external changes identified by Fernández-Güell et al. (2016). The proposal of Monzon (2015) is the one that clearly reflects the challenges and relates them to the dimensions of the Smart City, but not to stakeholders.

Finally, another topic of interest when analyzing the gaps in current conceptual models is their application to real case studies. The objectives of conceptual models do not only focus on the description of the concept, but rather on their possible use as a support for decision-making. Very few of the models were applied to real cases, with the exception of Fernández-Güell et al. (2016), which was used generically for Spanish cities. It would be useful to apply them in combination with analytical-statistical assessment, as occurs in the proposal of Lombardi et al. (2012).

As a conclusion, this state of the art has led to the identification of gaps that need to be filled in the representation of the Smart City. A conceptual model should represent the role of stakeholders in the Smart City as understood in literature, and existing models fail to show this in a comprehensive way. The analyzed models are not being able to represent the interrelation of the different dimensions combined with the central role of governance. The boundaries of the dimensions are not clear and overlap, and this fact also needs to be included in conceptual models. The Smart City as an answer to urban challenges posed by stakeholders, and not only by external global trends, has not been included in the analyzed models.

As a conclusion, there is a need of conceptual models able to represent stakeholders linked to the real implementation of Smart City projects as an answer to urban challenges in an integrated way.

3.2. State of the art on Smart City assessment

In order to select which project or strategy performs better in the context of the Smart Cities, it is necessary to provide an assessment of their effects on cities. However, there is a lack of standardized tools to assess the impacts of implementing specific Smart City Projects in specific cities or regions.

There are two approaches regarding Smart City assessment methodologies. On the one hand, benchmarking procedures were applied to produce a comparative analysis. On the other hand, a number of more conceptual assessment procedures are oriented toward measuring city impacts with a multidimensional approach. The first group could be labelled as ranking methods, because they provide for the possibility of ranking cities according to their performance level. This is the case with the Networked Society Index, developed by Ericsson (Networking Society Lab, 2016) or the Smart Cities Index developed by the Smart City Council (Cohen, 2014). There are also works of national interest, like the smart ranking of Italian cities (EY, 2016), conducted every year since 2013, or the IDC Smart City Analysis for Spanish Cities (Achaerandio, Bigliani, Curto, & Galloti, 2012). These studies measured city performance using a large

number of indicators. They evaluate improvements in separated performance areas of the Smart City, heterogeneously identified.

An improved ranking methodology is the work "Smart cities Ranking of European medium-sized cities" (Giffinger et al., 2007). This ranking uses a set of indicators to evaluate the performance of a group of European Cities that meet certain requirements in terms of size and accessibility of data and facilities (universities). This work classified the indicators into the six dimensions already mentioned in section one. Since then, this classification has been used in many scientific or consulting works (Cohen, 2014; Lombardi et al., 2012; Manville et al., 2014; Mattoni et al., 2015)

The second group of assessment methodologies attempts to correlate the basic elements of the Smart City concept. Leydesdorff & Deakin (2010) proposed a triple helix approach, considering three pillars: university, industry and government. Triple helix methodologies are used to analyze the dynamics of knowledge-based systems. Later, other authors such as Lombardi et al (2012) extend this approach by adding civil society and crossing indicators with the areas defined by Giffinger et al (2007) by using ANP (Analytic Network Process) models. It established relationships among the different areas and components, providing an integrated assessment aiming to include the opinion of decision-makers. It includes the opinion of agents through a relative weighting of the dimensions. Lazaroiu & Roscia (2012) also apply the dimensions proposed by Giffinger et al (2007), to design a methodology that uses fuzzy logic to include the opinions of experts. The Kourtiti et al. (2012) analysis takes the concept of creative cities and its influence on economic growth as a departure point (Richard Florida, 2003a), assimilating the concept of Smart cities into it. They reduced the number of indicators used with principal component analysis, focusing on economic indicators, and produced an analysis focusing on the temporal evolution of cities.

The lack of consensus on the definition of the Smart City has been already explained in Chapter 2. When it comes to Smart City Assessment, this research has taken as a departure point definitions which are based in a multidimensional vision of the Smart City, assessing different dimension of the smart City. Each of the mentioned methodologies assess Smart Cities. The important difference in Smart city assessment is if what is assessed is technology itself or the impacts of technology. The analyzed methodologies analyze either the impacts in the city or a combination of impacts and technological development (Italy). In this research is considered that technology is a means to reach outputs. Therefore it is focused in the separation of technological means (identified in the classification of projects) and challenges). For this, the assessment through projects is key.

As described in the introduction, smart cities are implemented through projects that should be designed under an integrated urban strategy (Angelidou, 2014). However, the assessment tools analyzed fail to take into account relevant aspects in the real implementation of smart cities through specific projects. Both the methodologies in the first and second groups provide general sets of indicators aimed at analyzing the general performance of the city. These indicators focus on selected areas where Smart City initiatives should have an impact, but are not related to real Smart City initiatives and projects in the city but to generic dimensions or areas (i.e. economy, environment, etc.). The impacts could therefore be the result of any kind of project that is part of a different strategy being developed in the city. Even if the impacts of the projects cannot be isolated in the city, more detailed links could be established between specific types of SCPs and indicators at a deeper level than the general dimension they affect. Therefore, there is a need for tools capable of measuring the impacts of SCPs in order to make informed decisions about Smart City development and implementation. These tools should not only be able to analyze isolated projects, but also to provide a comprehensive overview of the different projects in, and articulated by, the initiative.

Some attempts are being made in the direction of including the project scale in smart city assessment methodologies. The report “Mapping Smart Cities in the EU” (Manville et al, 2014), or the methodologies developed by Mattoni et al. (2015) or Branchi et al. (2014), become relevant examples in the field. The first one assesses the performance of Smart City Projects implemented in different European cities with regard to their capability to affect the six dimensions proposed by Giffinger et al. (2007), as well as to reach the Horizon 2020 objectives. The methodology proposed by Mattoni et al (2015) modifies and adapts these six dimensions to five groups of actions (Energy, Economy, Mobility, Community and Environment), but also includes the scale as a key element of the assessment: regional, city or district levels. The proposal of Branchi et al. (2014) develops a matrix where different urban technologies are evaluated regarding objectives organized in 6 different aspects: user, social, urban, environmental, economic and energy requirements. It analyses specific technologies (not projects) belonging to three areas: mobility, energy and quality of life. It provides a qualification and a score from 1 to 5 according to an analysis that combines qualitative and quantitative methods. The first two proposals are based not on indicators but on the interrelations between areas or actions (Mattoni, 2015), or the interrelations of these areas with objectives (Manville et al, 2014). The last proposal is not based on city indicators but on a specific project analysis method.

As explained in the introduction, smart cities must be understood as a tool to solve urban challenges. However, none of the assessment methodologies analyzed provide a sound multiple-objective assessment of smart cities or smart city projects in terms of the specific challenges

facing cities. Almost all organize their objectives according to implementation areas (Acharandio et al., 2012; Branchi et al., 2014; Cohen, 2014; EY, 2016; Giffinger et al, 2007; Kourtiti et al., 2012; Lazaroiu & Roscia, 2012; Lombardi et al., 2012; Manville et al., 2014; Mattoni et al., 2015) but do not establish clear relationships with the real problems of urban areas around the world. When they do, they do so generically (the Networked Society Index proposed by Ericsson (Networking Society Lab, 2016) focused on three challenges: climate change, air pollution and fossil-free energy consumption). This also means they are unable to adapt to the challenges of different areas or regions, as they propose sets of indicators to be used universally and which usually focus on the challenges facing cities in the developed world.

The introduction also highlighted the increasing importance of the role of governance in the Smart City. However, the analyzed methodologies do not reflect this fact. Only the methodology proposed by Lombardi et al. (2012) includes the opinion of stakeholders in the results. However it fails to link their opinion with the final goals of the Smart City: providing an answer to Smart City challenges.

There is therefore a clear need for an assessment tool that serves as a combined answer to these three gaps: first of all, the need to assess smart city initiatives through SCPs as the main tool for their implementation; secondly, the need to establish relationships between the impacts of smart city strategies and the challenges facing cities today, which differ among urban areas and regions; thirdly, the need of reflecting the increasing importance of governance and including the opinion of stakeholders in the evaluation..

As a conclusion, there is a need for an assessment tool capable of identifying impacts of smart city implementation projects on each city's specific challenges, and integrating all of them into a comprehensive view. This tool should also be able to include the opinion of stakeholders to reflect their points of view.

3.3. European Framework

The Smart City concept have been widely implemented in cities all around the world. However, due to the lack of consensus on the definition of the topic and their implementation at a local scale, they have been implemented with very different perspectives. Different kind of institutions have stablished guidelines for unifying criteria about the Smart Cities conceptualization, development and implementation at an international or national level. At international level, there are examples like Supra-governmental institutions like the European Union or the United Nations ,networks like the Smart City Council, organizations like the International Telecommunication Union or financial instituions like the European Investment Bank (Berst, Enbysk, & Williams, 2013; Cohen, 2014; International Telecommunication Union - Focus Group on Smart and Sustainable Cities, 2014; The European Commission, 2013). At national level, governments and cities organizations have made also different attemps like the Spanish network of Smart Cities or Belgium.

Today 78% of European citizens live in cities, and 85% of the EU's GDP is generated in cities, according to the (European Commission, n.d.). In European Cities, the concept of Smart Cities have been extensively implemented with different levels of intensity (Fig. 19). It became a brand for many European cities, which have made of the Smart City label a driver for their different objectives, such as technological implementation, urban development or city marketing. Due to the lack of consensus on the definition of the Smart City, it is also difficult to reach an agreement on the number of Smart Cities are being developed in Europe. The implementation of new technological solutions in municipalities takes place in most cities. Therefore, reports on the topic have proposed different criteria for defining which, and how many cities are becoming Smart. The report "Mapping Smart Cities in the EU" (Manville et al., 2014) considered cities over 100.000 inhabitants and identified 240 cities in the EU-28 that had "significant and variable Smart City activity". They focused mainly in cities developing projects about urban technological innovations financed by the European Union. Another characteristic can be the Smart City labelling. The Report on Urban policies for building smart cities (Collins, Alan; Leonard, Alan; Cox, Adam; Greco, Salvatore; Torrisi, 2017) identified 114 self-proclaimed "smart city projects" for the time period 2005-2016. In June 2018, Andreea Strachinescu, Head of Unit, New energy technologies, innovation and clean coal, DG Energy at European Commission provided data about Smart Cities under the framework of the European Innovation Partnership on Smart Cities and Communities (EIP SCC)(Claire Taylor, 2018). Under the programme, 78 cities in Europe have undertaken smart city development, but the program aims to reach the number of 300 by the end of 2019.

Figure 19: Intensity of participation in the calls of the European Marketplace of Smart Cities. Source: (EIP-SCC, 2016)

The definitions of different samples for the study and assessment of Smart City cases in Europe has also produced different numbers depending of the chosen characteristics. One of the characteristics used to define these sample has also been the size of cities, as in the Ranking for European Smart Cities, which focused in Medium-sized cities (70 cities were analyzed) and larger cities (90 cities between 300.000 and 1 million inhabitants from 21 countries). (Fig. 2)

Figure 20: 90 Larger cities analyzed in the European Smart Cities ranking by TU Wien. Source: (Rudolf; Giffinger et al., 2007)

The availability of data about the cities were the characteristics used to define a sample of 94 Smart Cities in Europe, (Caragliu & Del Bo, 2012) for the study of the European Smart Cities proposed by the authors.

Therefore, according to literature there is no consensus about the number of Smart Cities developed in Europe. However, there is an agreement among author in the wide spread of the concept among European cities and the importance of the implementation within the Smart City framework.

But it is not only a matter of number of Smart Cities. Different worldwide commercial rankings on smartness in cities are led by European Cities. (Cohen 2014; IESE 2016; Networking Society Lab 2016). Even if these rankings cannot be considered as proof of the quality of the cities, they are important for the marketing of cities.

The case of Europe is not only particular because of the amount of cases or the level of implementation. Smartness is one of the priorities for the Europe 2020 Strategy. The European Union also developed specific policies and financing instruments for the development of the Smart City concept. These two facts, the implementation and the political focus in the topic, have fostered each other.

The framework of the European Union Policies on Smart Cities is explained by Russo et al. (2014), that developed a diagram to explain it (Fig. 21).

Figure 21: The Smart City European Process. Source: Russo et al. (2014)

The Europe 2020 strategy was launched in 2010 as “A strategy for smart, sustainable and inclusive growth” (European Commission, 2010). Therefore, the strategy defines three priorities

smart growth, sustainable growth and inclusive growth. Smart Growth is understood as “developing and economy based on knowledge and innovation”. Five headlines targets are defined: employment, research and innovation, climate change and energy, education and fighting poverty and social exclusion. Finally, seven flagship initiatives were proposed under this strategy, three of which are related to Smart Growth: “Innovation Union”, “Youth on the move” and “A Digital Agenda for Europe”.

This first flagship initiative, the “Innovation Union”, is key for the development of Smart Cities in the European Union. The initiative focuses on: tackling the unfavourable framework conditions; avoid fragmentation of effort; focusing on innovation that address Europe 2020 societal challenges; Pursuing a broad concept of innovation and Involving all actions and all regions in the innovation cycle. The initiative has among its objectives “pooling forces to achieve breakthroughs” through the European Innovation Partnerships (EIPs) (European Commission, 2011b). The partnerships will be “challenge-driven”, will “act across the whole research and innovation chain” and will “streamline, simplify and better coordinate existing instruments and initiatives”, and attention to governance and working methods has been highlighted. Therefore, strategic planning and efficiency through a holistic approach are key, as well as the involvement and coordination of the different agents in innovation, are key for the initiative and the basis for the EIPs.

One of the partnerships selected for its implementation is the European Innovation Partnerships for Smart Cities and Communities, launched on July 2012 (European Commission, 2012) focused at the convergence of Energy, Transport and ICT in the Urban Context (Fig. 22).

Figure 22: Vision of the areas of the SCC, that focuses on the intersection of the three areas. Source: European Commission (2012).

The European Innovation Partnership on Smart Cities and Communities actions is coordinated by two plans: the Strategic Plan and the Operational Plan. The Strategic Plan defines the objectives of the EIP-SCC, proposes a structure in three areas and eight action clusters and defines eleven actions for its successful implementation. (EIP-SCC, 2013b)

The three areas are Sustainable Urban mobility, Sustainable Districts and Built Environment and Integrated Infrastructure and processes across Energy, ICT and Transport. Eight transversal action clusters are developed: citizen focus; business models, finance and procurement; integrated infrastructures and processes; integrated planning, policy and regulations; sustainable districts and built environment; sustainable urban mobility.

Figure 23: Structure of the EIP-SCC. Source:

Therefore, the main instrument for the European Union for pushing the Smart City concept is a Partnership among stakeholders, governance being the key element. Decision making plays a key role with three Action Clusters: Citizen Focus, Policy and Regulation and Integrated planning. The integrated vision is also crucial for the Innovation Union, as said before.

The Operational Implementation Plan (OIP) (The European Commission, 2013) is a companion document to the Strategic Implementation plan. It develops in detail the eleven priority areas proposed in the SIP (corresponding to the three main areas plus the eight action clusters) and proposes general implementation modes. It defines potential actions for each of the priority areas.

Governance is key not only for the development of Smart Cities in the European Union, but also for the implementation (Fig. 23). In fact, according to its website (EIP-SCC & European Commission, 2016), the EIP-SCC consists of the High Level group (supported by its Sherpa group) and the Market place.

- The High level group is conformed by the High level representatives of industry, research and cities, that includes associated members to conform its Sherpa Group (Russo et al., 2014). The HLG focuses on barriers for the development of Smart Cities and societal needs and advises the European Commission. The HLG supported by Sherpa group developed the

Strategic Implementation plan (EIP-SCC, 2013b). The Sherpa group was in charge of the Operational Implementation plan.

- EIP-SCC Marketplace brings together cities, industries, SMEs, investors, researchers and other smart city stakeholders. It aims to “Engaging cities, industry and financiers in interest matching activities, leading to project design and delivery” (EIP-SCC, 2016) Fig. 24.

Figure 24: Governance structure of the EIP-SCC. Source: (Russo et al., 2014)

It is important to remark that the EIP-SCC is not a financing instrument. However, the European Union offers specific financial tools for Smart Cities. According to the Operational Implementation plan, Smart City initiatives were initially implemented through small projects with disbursement at project level. On a second wave, projects of a bigger scale were implemented and financed through public grants, i.e. through the FP7. In 2013 a new wave was considered to start framed in the EIP-SCC. This wave is characterized by the collaboration of public-private sectors and co-financing of public funds.

The Strategic Implementation Plan proposed the “Lighthouse initiatives” establishing city groupings to achieve (together with industries and other stakeholders) smart city solutions. They aim to achieve the 20/20/20 goals based on integrated technologies across the mobility, ICT and energy sectors. They are partly financed by Horizon 2020, the European Commission’s research and innovation programme on the areas low energy districts; integrated infrastructures and sustainable urban mobility. From 2014 to 2018, a total of twelve Smart Cities and Communities ‘Lighthouse’ projects were funded, reaching €270 million (Claire Taylor, 2018).

Other public and private funding sources can finance other Smart City projects and activities, like JESSICA (Joint European Support for Sustainable Investment in City Areas), Risk Sharing Financing Facility (RSFF) or ELENA (European Local ENergy Assistance) (Russo et al., 2014).

As a partial conclusion, instead of focusing on financing, the EIP-SCC has focused on bringing together Cities, Industries and funders/financers (Fig.25). This shows the importance of bringing together the different stakeholders for the European Union cities. The financial tools for the implementation of Smart City initiatives for the period 2014-2020 are focused to the combination of public and private fundings, and the involvement of diverse stakeholders.

Stakeholders' involvement is therefore one of the key elements of the development of the Smart cities in Europe. The definition of the Smart City as a “multi-stakeholder, municipally-based partnership”, appearing in the report of the European Commission “Mapping smart cities in the EU” (Manville et al., 2014), clearly reflects this idea. Different initiatives aim to bring together stakeholders in European cities for the development of Smart City projects. The European Marketplace for Smart Cities and communities focuses on three groups of stakeholders: Cities, Industries and funders/financers (Marketplace of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC, 2016).

Figure 25: Main stakeholders according to the EIP-SCC. Source: EIP-SCC (2016)

The analysis of the share of organisations leading the smart city projects belonging to the European Innovation Partnership for Smart Cities and Communities shows the main role of public authorities (Fig. 26). But also business have a great importance in the promotion of Smart Cities.

Figure 26: Classification of lead organizations leading smart city projects belonging to the European Innovation Partnership for Smart Cities and Communities. Source (European Commission, n.d.-b)

NGOs and private individuals reach together an 8% of the share of leadership. A small share if we compare it to the other groups. Institutions and business are having trouble to communicate and spread the Smart City concept among civil society, and to reach their involvement.

There is also a difficulty for the Smart City concept to reach citizenship. In 2016 study of the British IET (The Institution of Engineering and Technology, 2016) asked citizens about their definitions of the Smart City. Some of the citizens definitions does not go much further than “Wi-fi and techno stuff” or “A place where electronics firms gather”, even if some others revealed an understanding of their own role, like “city where people are smart “. However, in general terms, their idea of the Smart City was very fuzzy and unclear. No research of this kind was made at a European level, but the British case serve as an example of the existing gap between the Smart City and citizens.

The concept of Smart City is widely spread and implemented in European Cities. European Union has developed policies and financing tools for the development of the concept, which are mainly focused on the cooperation of stakeholders. However, not all stakeholders share the same vision, and they are not involved at the same level in the platforms. The visions of the different stakeholders must be taken into account to foster their involvement. Their ideas should be compared with the implementation of the Smart City concept to see if they are being listened and included. As a conclusions, there is a need to bridge the gap between Smart City implementation and discourses in the European Region.

CHAPTER 4: PROPOSAL OF A SMART CITY CONCEPTUAL MODEL

CHAPTER 4: PROPOSAL OF A SMART CITY CONCEPTUAL MODEL

In this chapter proposes a Smart City conceptual model. It is an extended version of section 3 of the article “Smart City implementation and discourses: An integrated conceptual model. The case of Vienna.” published in the scientific journal “Cities” (See Fernandez-Anez et al. 2017). See annex 6 for the complete documents.

In this chapter the basis for the proposed conceptual model are defined taking as a basis the definitions of conceptual model in chapter 3. This conceptual model is an abstract representation of the Smart City system, gathering both physical and social aspects. It takes as a basis the principles defined in chapter one. Therefore, it is focused on representing the complex reality of the Smart Cities according to the defined concepts. It aims to enhance understanding of the reality, as well as to simulate different stages and points of views about it.

After analyzing the use of conceptual models in the scientific literature on Smart Cities, a new model is proposed. This research understands the Smart City as an integrated and multi-dimensional system that aims to address urban challenges based on a multi-stakeholder partnership. The conceptual model proposed follows a comprehensive and integrative approach to Smart Cities that links the three main issues identified: (a) the key role of governance and stakeholders’ involvement (see 4.1.); (b) the importance of displaying a comprehensive vision of Smart City projects and dimensions (see 4.2.); and (c) the understanding of the Smart City as a tool to tackle urban challenges (see 4.3.). Finally, in 4.4., the three parts of the conceptual model are shown interrelated. The model is described from the center to its outer limits, but not necessarily in a linear sequence, in order to aid its understanding.

4.1. Subsystems and stakeholders.

Figure 27: Basis for the conceptual model. Source: Fernandez-Anez et al, 2017.

The model places the stakeholders at the center (Fig. 27), as governance structures are considered the core of the Smart City. Several authors (Albino et al., 2015; Batagan, 2011; Castelnovo et al., 2015; Fernández-Güell et al., 2016; Nam & Pardo, 2011a) consider citizen-centric approaches to be at the heart of governance in the Smart City. Other authors view quality of life as the main goal for Smart Cities in a human-centric vision (Caragliu, Del Bo, & Nijkamp, 2011; Dameri, Negre, & Rosenthal-Sabroux, 2016; Misuraca, Ferro, & Caroleo, 2010). Citizens are therefore placed at the center of the model.

The literature on Smart Cities uses the university-industry-government triple helix model (Leydesdorff & Deakin, 2010) to study the stakeholder structures operating within it. Some authors also include civil society as one of the groups in an extended triple helix model (Etzkowitz & Zhou, 2006; Lombardi et al., 2011). Four stakeholder groups are therefore at the core of the conceptual model: political, social, economic and knowledge stakeholders (Fig. 1). Political stakeholders include government institutions and political parties; social stakeholders are civil society experts and institutions; economic stakeholders comprise a wide range of public and private companies; and finally knowledge stakeholders are universities and research centres in the city. All these groups overlap, and experts and institutions may belong to more than one. Citizenship overlaps all the subsystems.

4.2. Smart City dimensions and initiatives

Figure 28: Smart City dimensions and initiatives. Source: Fernandez-Anez et al, 2017.

The Smart City stands at the confluence of the spatial and technological subsystems as an answer to urban challenges. Many authors use the work of Giffinger et al. (2007) as the basis for systematizing the approach to the complexity of the Smart City. This work conceptualizes six Smart City dimensions: “Governance”, “Economy”, “Environment”, “Mobility”, “People” and “Living”. Smart City initiatives are organized around stakeholder groups and urban challenges to respond to the requirements of different stakeholders (Fig. 28). Initiatives can (and should if they aim to be integrative) affect more than one group, thus increasing efficiency in urban management. Governance issues gradually move to center stage in discussions on the Smart Cities (Meijer & Bolivar, 2015), and some authors identify them as essential for their success (Albino et al., 2015; Nam & Pardo, 2011a). SC governance initiatives are placed at the center of the conceptual model since they tend to lead the development of other SC dimensions.

This structure is the basis for classifying the projects to be included in Smart City Initiatives, as in the proposal of the ASCIMER project (Monzon, Andres; Fernandez-Anez, Victoria; Velazquez-Romera, Guillermo; Perez-Prada, 2017; Monzon, 2015). It was developed taking as a departure point the best practices survey developed in mentioned project. Table 12 shows the final structure of this taxonomy for Smart City Projects proposed in Fernandez-Anez et al., (2018).

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

	PROJECT AREAS	PROJECT ACTIONS			
Smart Governance	SGo1. Participation	Complaints and suggestions	Participation in decision making	Collaborative production of services	
	SGo2. Transparency and information access	Open data.	Governmental transparency	Representation and access to information	
	SGo3. Public and Social Services	Online public and social services.	Services integration and interconnection.	Public entities in social networks.	
	SGo4. Multi-level governance	Integration of governmental levels	Interconnectedness of governmental levels		
	SGo5. Efficiency in municipal management	Efficiency in management, regulations and instruments.	Efficiency in the provision of services		
Smart Economy	SEc1. Innovation	Policies and plans for enhancing innovation.	Physical infrastructure for innovation.	Services for innovation.	New business based on innovation
	SEc2. Entrepreneurship	Entrepreneurial education and training.	Creation of entrepreneurial environments.	Entrepreneurial support policies and actions	
	SEc3. Local & Global interconnectedness	City internationalization.	Business and commerce networks.	Presence of business in the internet.	Globalization risk management.
	SEc4. Productivity	Physical and technological infrastructure for productivity	Management for adaptation		
	SEc5. Flexibility of labor market	Measures to improve accessibility to labor market	Measures to combat unemployment.	Technological improvements for flexibility	
Smart Mobility	SMo1. Traffic management	Strategic corridor and network management	Incident management	Safety enhancement	Real time traveler information
	SMo2. Public Transport	Real time traveler and operator information	Safety and security enhancement.	Public transport alternatives.	Integrated payment systems
	SMo3. ICT Infrastructure	Systems for data collection	Systems and protocols for data communication	Systems and procedures to ensure quality of the data	Payment systems&Ticketing
	SMo4. Logistics	Improvement on the traceability of goods	Fleet tracking&management	Stock management	Last mile solutions
	SMo5. Accessibility	Enhancing physical accessibility	Enhancing digital accessibility	Enhancing socio-economical accessibility	Enhancing cultural accessibility
Smart Environment	SEn1. Network and environmental monitoring	Clean energy in traffic and parking.	Cycling options.	Walking options.	Alternative motorized options
	SEn2. Energy efficiency	Passenger multimodality	Freight multimodality		
	SEn3. Urban planning and urban refurbishment	Environmental monitoring	Network monitoring.	Applications to visualize the information collected	
	SEn4. Smart buildings and building renovation	Smart grids.	Renewable energy.	Energy efficiency in buildings and districts.	Energy efficiency in public devices.
	SEn5. Resources management	Urban planning in new developments.	Urban Refurbishment.	Urban management related to planning.	Participation in urban management and planning
Smart People	SEn6. Environmental protection	Sustainability in new buildings.	Sustainability in building renovation.		
	SEn7. Awareness and behavioral change	Waste management.	Water management.	Food management.	Consumption patterns.
	SPe1. Digital education	Natural resources protection.	Ecosystems protection.	Biodiversity protection.	
	SPe2. Creativity	Tools for behavioral change	Awareness rising tools	Involvement in sustainable measures in buildings and urban spaces	
	SPe3. ICT - Enabled working	Technology and learning methods.	Skills for technology.		
Smart Living	SLi1. Tourism	Fostering creative activities	Creative networks.	Partnerships including creative entities.	
	SLi2. Culture and leisure	Measures and platforms for employment.	Home-based work and workplace flexibilization.	Timetable flexibilization.	
	SLi3. Healthcare	ICT-enabled bottom up initiatives.	Community based organizations networking and platforms.	Community and urban life information spreading and sharing	
	SLi4. Security	Human rights watch.	Inclusion policies and measures	Civil society organizations support	
	SLi5. Technology accessibility	Tourism information via Internet.	Tourism accommodation facilities.	Online tickets or tourist card.	Integration of tourism with urban activities
Smart Living	SLi6. Welfare & Social inclusion	Culture information via Internet.	On-line tickets, and reservations	Cultural heritage management.	Participation in municipal cultural program
	SLi7. Public spaces management	Disease prevention.	Promoting healthier lifestyle and well-being.	Improve access to healthcare.	Health information and education.
	SLi8. Security	Urban security.	Security services online.	Digital security	
	SLi9. Technology accessibility	Accessability to people with disabilities and functional limitations	Overcoming technological barriers	Measures to solve environmental factors.	Measures to solve cultural and income limitations
	SLi10. Welfare & Social inclusion	Improving accessibility to labor market	Gender inclusion; family and children aid	Services for immigrants.	online volunteering and Interconnection with services
Smart Living	SLi11. Public spaces management	Integration and connection of uses in public space.	Adaptation of public space to users.	Public space management	

Table 12: List of project groups in the different dimensions. Source: Fernández-Anez et al, 2018.

The taxonomy is structured into 3 levels: Smart City dimensions, Project Areas and Project actions. The first level has been described in the previous paragraph: the six Smart City dimensions (Governance, Economy, Mobility, Environment, People and Living). The second level, named Project Areas, aims to group the main initiatives that have been identified in the surveyed project. It provides a first level of classification that can be used to simplify the description of the Smart City projects and initiatives. Five to seven Project Areas have been described in each of the dimensions, reaching a total number of 36 project areas. The third level, named Project Actions, described the main actions developed by the Smart City projects. A total number of 118 Project Actions has been described (82 to 4 per project area). This taxonomy is not a closed system and it aims to be in permanent revision and evolution, as urban technology is fastly changing. New project actions and areas can be added to the proposal in the future.

The taxonomy is a tool that allows to describe the complexity of Smart City projects considering their multiple dimensions. It can be used either to describe existing projects or to develop new proposals. A Smart City initiative can combine projects belonging to more than one of the defined dimensions, mixing Project actions belonging to different Project Areas and dimensions. This multi-dimensional perspective and complexity lies at the core of the definition of the Smart City.

A Smart City initiative can combine projects belonging to more than one group and more than one of the dimensions defined in Fernandez-Anez et al. (2018).

In order to demonstrate the use of the tool, and example of the classification of two projects of different characteristics and sizes is provided.

The first example is the app of the Vienna Municipal Department 48: MA48 App.

Figure 29: Logo of the application. Source: Vienna Smart City strategy page

The MA 48 (Fig. 29) is in charge of waste management, cleaning of streets and fleet of vehicles. The application offers all the key information on waste disposal in Vienna. The public access

facilities of the waste management, street cleaning and vehicle fleet divisions (MA 48) can be easily located in the city plan. A calendar lists upcoming collection dates for mobile waste collection points for problematic waste, the "yellow bag" collection for single-family homes included in the 22nd District 22 area, as well as upcoming MA 48 events.

The "Waste ABC" of the application provides clear information on environmentally correct waste separation, news updates and easy contact with MA 48: the complete package. In addition, you can access important information about the central services of lost objects in Vienna.

More than 13,000 users have already downloaded the application, this took place in approximately 14 months. Approximately 100 new users are added every week.

The following classification is proposed in Table 13:

	Project Areas	Project actions	Specific actions
SMART ENVIRONMENT	SEn1. Network and environmental monitoring	Network monitoring. Applications to visualize the information collected	monitoring of the elements of waste management
	SEn5. Resources management	Waste management.	It is the main objective of the tool
	SEn7. Awareness and behavioural change	Tools for behavioural change	Contains guidelines on waste separation
SMART GOVERNANCE	SGo1. Participation	Complaints and suggestions	Provides direct communication with the council
	SGo2. Transparency and information access	Open data.	Provides information about the service
	SGo5. Efficiency in municipal management	Efficiency in the provision of services	Provides information about the service

Table 13: Classification for the project MA48 app. Source: author's own elaboration-

The second example is the urban development "Aspern Urban Lakeside Vienna". The integrated design of the public space is the backbone of the prospective urban development. "Aspern Urban Lakeside Vienna" is a project of new dimensions. The project area of 240 hectares makes it one of the largest urban developments in Europe, it is a city within the city. Quality of life and cooperation are at the top of the agenda.

Aspern Urban Lakeside in Vienna will be built in the northeast of the city by 2028. In the future, 8,500 housing units will accommodate 20,000 people. In addition, 20,000 jobs will be created in the fields of service, commerce and industry, science, research and education.

A project of this scale, almost a city in itself, needs a very complex classification that provides multiple examples, and for that reason it has been selected. We can see it in table 14:

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SMART GOVERNANCE	Project Areas	Project actions	Specific actions
	SGo1. Participation	Participation in decision making Collaborative production of services	Creation of the masterplan with citizen participation Citizen collaboration in the implementation through "city labs"
SMART ENVIRONMENT	SEn1. Network and environmental monitoring	Network monitoring.	Monitoring of the electrical network
	SEn2. Energy efficiency	Smart grids.	Sensorized low voltage network managed by Siemens
		Renewable energy.	incorporation of renewables in urban lampposts
		Energy efficiency in buildings and districts	Management of buildings by Siemens
	SEn3. Urban planning and urban refurbishment	Urban planning in new developments.	Smart and sustainable urban planning
		Participation in urban management and planning	Citizen participation in urban design
	SEn4. Smart buildings and building renovation	Sustainability in new buildings	New buildings' construction according to sustainable criteria
	SEn5. Resources management	Waste management.	Management of construction waste integrated into landscape design
	SEn6. Environmental protection	Natural resources protection.	Protection of the natural environment
		Biodiversity protection.	Creation of a lake for birds, being in a migratory passage
SMART MOBILITY	SEn7. Awareness and behavioural change	Tools for behavioural change	Energy efficiency and mobility guidelines are provided
		Involvement in sustainable measures in buildings and urban spaces	Participation in the design of urban spaces
	SMo1. Traffic management	Strategic corridor and network management	Pedestrianization and restricted traffic areas
	SMo2. Public Transport	Public transport alternatives.	Oriented since the beginning to its access in public transport, with information available through the apps of the City of Vienna
	SMo3. ICT Infrastructure	Fleet tracking&management	Implementation of a "big data" collection system associated with energy
	SMo4. Logistics	Last mile solutions	The use of bicycles has been incorporated for the local distribution of goods
	SMo5. Accessibility	Enhancing physical accessibility	Urban design with accessibility criteria
	SMo6. Clean and non-motorised	Cycling options.	Public bicycle service
		Walking options.	Pedestrian ways
	SMo7. Multimodality	Passenger multimodality	Combination of public transport with private and public bicycles
SMART PEOPLE	SPe4. Community building and urban life management	Community and urban life information spreading and sharing	Platforms for dissemination of participatory meetings
	SPe5. Inclusive society	Inclusion policies and measures	Social inclusion in discussion platforms

Table 14: Classification for the project “Aspern Urban Lakeside Vienna” (continues in table 15). Source: Author's own elaboration

SMART LIVING	SLi7. spaces management	Public	Adaptation of public space to users.	Co-creation of public spaces through workshops
	SEc1.Innovation		Policies and plans for enhancing innovation. New business based on innovation	Creation of an innovation center 20,000 jobs will be created in the fields of service, commerce and industry, science, research and education.
SMART ECONOMY	SEc2. Entrepreneurship		Physical infrastructure for innovation.. Entrepreneurial education and training. Creation of entrepreneurial environments.	Spaces for companies based on innovation Training courses Spaces for new businesses in the innovation center

Table 15: Classification for the project “Aspern Urban Lakeside Vienna” (continues table 14). Source: Author’s own elaboration

Finally, support subsystems for the Smart City are defined in the conceptual model:

Figure 30: Stakeholders at the core, surrounded by the spatial, technological and environmental subsystems. Source: Author’s own elaboration.

Stakeholders are at the core of the city system and are supported by two main urban functional subsystems –spatial and technological–, where the city is understood as the confluence of these two spaces (Castells, 2004) (Fig. 30). The elements in the human-built urban environment form the urban spatial subsystem: streets and urban infrastructures, housing, buildings, facilities, open spaces, etc. The technological subsystem consists of the various technological tools developed in the city, and –in the Smart City literature– is mainly based on ICT and information transfer (Batty et al., 2012b). It articulates and connects the elements in the spatial subsystem. In the next step, the Smart City is seen as the confluence of these two different subsystems. Lastly, the environmental subsystem remains outside the model as the basis and support for any urban development.

4.3. Challenges and global trends

Figure 31: Global trends and urban challenges affecting the conceptual model. Source: Fernandez-Anez et al, 2017.

As explained in chapter 1, Smart Cities must be understood as a response to urban challenges, according to different authors (Albino et al., 2015; L. Anthopoulos et al., 2015; Chourabi et al., 2012; De Santis et al., 2014; Meijer & Bolivar, 2015; Nam & Pardo, 2011c). The conceptual model of a Smart City can only be defined by understanding the challenges and trends that affect the city. Citizenship and stakeholder groups pose important challenges that the different urban functional subsystems need to answer.

The main global trends and challenges affecting cities in the European region were identified in the literature review (European Commission, 2011a; Fernández-Güell et al., 2016; Nijkamp & Kourtit, 2013) and compared with the opinions of the stakeholders interviewed to complete the selection. The challenges raised by the stakeholder groups are entered in the model as a new element that surrounds these groups (Fig. 31), and are closely related to more general global trends also affecting European cities, which are identified and placed outside the model. Table 7 shows the list of identified challenges grouped by global trends (Fernandez-Anez et al, 2018). They were identified through a literature review (European Commission 2011; Nijkamp & Kourtit 2013; Fernández-Güell et al. 2016). Modifications on the table were made according to the suggestions of the experts interviewed in the pre-validation stage described in section 5.2..

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GLOBAL TRENDS	URBAN CHALLENGES
1. CLIMATE CHANGE	1.1. Reducing ecological footprint and pressure on ecosystems, promoting ecological functions of land
	1.2. Increasing efficiency in resource management (energy, water, etc.) and promoting a circular economy
	1.3. Fostering cities' resilience to climate change and disaster risks
	1.4. Developing eco-friendly urban environments and responding to growing environmental concerns
	1.5. Implementing a holistic approach to environmental issues
2. SOCIAL POLARISATION	2.1. Promoting social inclusion, cohesion and equity
	2.2. Enhancing the inclusion of migrants and refugees
	2.3. Adapting the city's economic and social life to an ageing population while attracting young people and children
	2.4. Promoting equity in access to the labor market and the work-life balance
	2.5. Eradicating spatial exclusion and promoting equity in access to housing and quality urban environments
3. NEED FOR NEW GOVERNANCE MODELS	2.6. Enhancing social diversity as a dynamic asset
	3.1. Changing to a more participative and inclusive democracy
	3.2. Promoting citizenship via urban co-creation and co-management combining top-down and bottom-up models
	3.3. Increasing the flexibility and resiliency of governance models
	3.4. Improving the effectiveness of institutions, coordination among public bodies and multilevel governance (leading to more integrated sector policies)
4. GLOBAL URBANISATION	3.5. Incorporating and regulating innovative management systems at the local level while improving capacity building (i.e. PPP or PPPP, e-governance, etc.)
	3.6. Enhancing territorial cohesion
	4.1. Managing the urban population growth while reducing negative externalities
	4.2. Maintaining quality of life in cities, ensuring access to services in line with changes in demand (education, health, culture, safety, etc.)
	4.3. Promoting interurban variety and cities' identity by protecting cultural heritage
5. ECONOMIC INSTABILITY	4.4. Developing new planning tools for sustainable development (less urban sprawl, polycentric plans, increased density and diversity, mixed land use, urban refurbishment...)
	4.5. Fostering sustainable accessibility in cities and promoting sustainable, inclusive and healthy mobility when needed
	4.6. Balancing urban growth and territorial development (managing the urban-rural balance)
	5.1. Improving the resilience of economic systems and adaptation to changes in global and local economies
	5.2. Improving the sustainability and diversity of local economies in balance with cities' specialization
6. INCREASING IMPORTANCE OF NEW TECHNOLOGIES	5.3. Managing adaptation to innovation and knowledge-based economies while providing solutions to a broad skill base
	5.4. Fostering human and social capital as source of innovation
	5.4. Enhancing integration in global economies, promoting cooperation among cities and territories
	5.5. Fostering employment creation with high quality standards
	5.6. Achieving balance between competitiveness and quality of life
6. INCREASING IMPORTANCE OF NEW TECHNOLOGIES	6.1. Enhancing the adaptation of society, governance and economy to transformation through ICT
	6.2. Coordinating new technologies for energy saving and reducing emissions through planning and governance tools
	6.3. Articulating mobility planning tools and policies with innovations in the sector
	6.4. Promoting technological innovation driven by social and human capital
	6.5. Reducing externalities in the implementation of new technologies (i.e. cybersecurity)

Table 16: Global trends and associated urban challenges identified. Source: Fernandez-Anez et al, 2018.

4.4. Diagram of the global vision

Based on the discussion above, the conceptual model shows the various stakeholders and urban subsystems in relation to the different Smart City dimensions and initiatives and the contextual challenges affecting cities (Fig. 32).

Figure 32: Smart City conceptual model. Source: Fernandez-Anez et al, 2017.

Following the sequence previously described (4.1., 4.2. and 4.3.). Figure 29 displays the three elements according to the three main issues identified:

- At the core, citizens and stakeholders (Political, knowledge, Economic and social) are placed
- They are surrounded by the different dimensions that classify the Smart City projects: Governance, Environmenta, Mobility and Infrastructures, Economy, People and Living. Of these dimensions, Governance plays a central role coordinating the other dimensions. They are articulated by the technological subsystem and rely on the Spatial subsystem.
- Global trends is the third main issues and surround the other two affecting and modifying them.

The description of the case studies (6.1.1., 6.1.2. and 6.1.3.; 6.2.1., 6.2.2. and 6.2.3.; 6.3.1., 6.3.2. and 6.3.3.) will also follow this sequence, finally showing the complete model (6.1.4., 6.2.4 and 6.3.4.).

This model offers a comprehensive vision of a city and serves as an instrument to achieve greater coherence in Smart City initiatives. It allows understanding the interrelations among the three layers and to extract conclusions about their intertwined influence in changes in cities. The report “Mapping smart cities in the EU” defines a Smart City as a “multi-stakeholder,

municipally-based partnership” (Manville et al., 2014), and highlights the engagement of multiple stakeholders, coordinated by a municipality, as a key factor for the Smart City. The pre-validation phase of this research also confirms that local government stakeholders are the main potential users of SC initiatives.

4.5. Benefits and limitations of the proposed model

The proposed model pretends to provide a systemic and holistic overview of the elements of the Smart city and their interactions. The model represents different theories in the field in an interrelated way. It aims to support the understanding of the complexity of the Smart City.

A conceptual model, according to Kuhn and Solvberg (1986) should satisfy four principles:

1. *“Enhance an individual's understanding of the representative system*
2. *Facilitate efficient conveyance of system details between stakeholders*
3. *Provide a point of reference for system designers to extract system specifications*
4. *Document the system for future reference and provide a means for collaboration “*

The proposed conceptual model complies these requirements, as we will see in the following chapters and we will discuss in the research conclusions.

The conceptual model aims at helping the understanding of the Smart City elements in an intertwined way. The main benefit of the model is to allow a systemic representation of a complex system, the Smart City, in a simplified way. Following the previous principles and focusing on the possible uses of the model, some of its benefits would be:

1. Serve as a basis for individual understanding to different stakeholders. Stakeholders can place themselves and other stakeholders in the system, understand the different elements and define their position according to them. Another benefit derived from this one can be the collective communication, using the model to communicate the strategy to the public or to the different stakeholders. The benefits of the model as communication enabler can also be used for dissemination and communication strategies, but also for capacitation of municipality staff and professionals in the different fields.
2. Allow discussion among stakeholders, in order to understand the details (but also the general aspects) of their vision of the Smart City. Discussions can enrich the model and the real strategy it is based on, and help to achieve consensus on the approaches.
3. The system display constitutes a general reference for the development of specific proposals or strategies. Furthermore, it also allows a general and integrated vision that can serve as a

basis for the re-design or the design or future steps of the Smart City strategy by the municipality

4. To represent the past, current and future stages of the Smart City strategy of a city. This can facilitate collaboration among stakeholders participating in the initiative in the different stages. Allowing the comparison between different cities, it can also foster collaboration among cities facilitating the understanding of the context for the correct replication of the initiatives.

As a summary, the main model benefits are fostering understanding and communication of the strategy for discussion, communication, capacitation or design. This research will explore the use of the model for discussion with individual stakeholders and for the representation of past and current stages of the Smart City strategies of cities, allowing comparison. The model should be in permanent evolution to include changes in the governance structure, innovations in the sector and new global trends.

This model presents also certain limitations. This research could be framed in the middle range theory concept (Merton, 1949). The middle range theory is an approach developed in the field of sociology to define the theories that bridge theory and empirical research. This conceptual model pretends to be a tool for connecting the general urban and specific Smart City theories with their empiric survey. The main flaws of the proposed model relay on this intermediate scale:

- The proposed conceptual model does not present an innovation in the field of general urban theories. It takes as a departure point existing theories in the field. It mainly focuses in stablishing a comprehensive overview that interrelates existing knowledge.
- This conceptual model is a macro-representation of the Smart City. It is not a mathematic model aimed to support complex simulations. However, it can be used as a departure point of a very simple empirical research, as following chapters will present. This can lead the obtention of general overviews of the case studies and help the creation of general guidelines. But decision making needs also further empirical support and the use of specific indicators.

Other limitations of the model could be related to the benefits previously described:

1. The difficulties to enhance individual's understanding in people with different skills and visions. This is especially difficult for people with visions focused on general global theories and with very specific knowledge, who may find it difficult to reach the individual scale. Individual understanding might also be a problem for people with no previous knowledge about the Smart City or with difficulties for understanding abstract representations of reality.

2. The relationship between the specific scale and the intermediate scale has been developed in this research and included in the form of a multi-scalar project classification proposal (See chapter 4). However, it only reaches a certain scale. Further levels of specification might have to be defined by professionals of the different sectors.
3. The documentation for future reference might have to be revised according to future models. Collaboration is only possible if stakeholders accept the system as a basis for their understanding. This is only possible if the model takes their opinion as a departure point and is able to represent them. This research is focused at using the model to overcome this limitation.
4. The need of permanent revision of the model to include innovations and changes might become a problem for comparison. The model is flexible to include innovations and changes, however if the model can only be modified between certain limits to allow comparison.. When disruptive knowledge in the field arrives, the model can be need to be completely reformulated, developing new models. This can disable the capacity of the model for comparison of different cities and stages of the strategies.

These benefits and limits will be further discussed in the conclusions section under the light of the conceptual model application to various case studies.

CHAPTER 5: METHODOLOGY

CHAPTER 5: METHODOLOGY

This chapter explains the methodology of this research. This methodology was published in the article “Smart City implementation and discourses: An integrated conceptual model. The case of Vienna.” published in the scientific journal “Cities” (See Fernandez-Anez et al. 2017). This chapter is an extended version of the methodology proposed in the article. (See annex 6)

5.1. Research process: general insights

Figure 33 shows the methodology for the development of the conceptual model and its application divided into six steps: Hypothesis and research questions; State of the art; Conceptual model; Methodology development; Application to case studies and Conclusions.

Firstly we will explain the stages described in the previous chapters (Chapter 1, 2, 3 and 4).

The first step is the formulation of the research hypothesis and the research questions. This step is developed in chapter 1. A research framework is developed to explain the relevance of the problem. Taking it as a departure point, the research hypothesis is formulated: “Smart Cities are not being able to materialize the discourses and visions of the different stakeholders involved”. To prove this hypothesis, two research questions need to be answered. The first one focuses in the development of a methodology for analyzing and providing data that can lead to the confirmation (or not) of the hypothesis. The second one is aimed at proving the hypothesis in a specific context (the European Region) using case studies (the selected cities).

The development of the state of the art on the questions that affect this research constitutes the second and third chapter. Firstly, in chapter two, the importance of how different Smart City stakeholders define the subject is explored. For this purpose, a methodology is proposed, that will be included in the final methodology used in the main research. Definitions by different stakeholders are explored in existing literature, and institutions and corporation webpages and reports. Secondly, through an extensive literature review, the state of the art is extended to three more areas: conceptual models, assessment tools and the development and policies about the Smart City in the European Region. As a conclusion of this state of the art, four main ideas are extracted, that will establish the basis to answer the research questions:

- The importance of Smart Cities definitions by different agents
- The need of an integrated Smart City conceptual model
- The need of the use of the conceptual model as a tool for comparison and pre-assessment
- The need to bridge the gap between Smart City implementation and discourses in the European Region

According to the literature review, three main ideas were extracted to build the conceptual model in Chapter 4:

- a. The importance of involving stakeholders and the central role of governance.
- b. The implementation of Smart Cities through projects in different fields or dimensions.
- c. The orientation of the Smart City towards facing urban challenges.

These key ideas reflected in chapter 3 became the backbone of this study and led to the development of a conceptual model of Chapter 4. The model combines three elements: stakeholders, projects (classified by dimensions) and challenges they face.

In chapter 5, the current chapter, the complete methodology of this research is explained. Therefore, the methodology for using the proposed conceptual model to prove the hypothesis is also explained.

The stage of pre-validation of the methodology is explained in detail in this chapter. The conceptual model was pre-validated by a group of experts, and changes were made. The purpose of this first set of interviews (Interviews I, June 2016; see Table 19) was twofold: to validate the survey methodology and to validate the conceptual model. The methodology uses text analysis through coding and is based on the work of AlAwadhi & Scholl (2013), using a set of semi-structured interviews (Callejo Gallego, Del Val Cid, Gutierrez Brito, & Viedma Rojas, 2009) as the main instrument, in what is usually considered a participatory method. Stakeholders were rationally selected to work with a small but representative sample (Mitchell, Wood, & Agle, 1997). The interviews focused on the three main ideas previously described and on validating the first version of the conceptual model. They were semi-structured to allow the identification of additional concepts. The sample was composed by selecting a group of stakeholders following two criteria: they belonged to different stakeholder groups in similar numbers; and they were specialized in different Smart City dimensions and in transversal areas of technology and planning (at least one expert in each dimension (6) and area (2)). A total of nine experts were chosen from international and local government institutions, universities and research centers, private companies of different sizes, and national and international NGOs. The experts interviewed came from Spain, Austria, Luxembourg and France. Data was collected through interviews in person or via videoconference, lasting between 50 to 70 minutes. They were audiotaped and partially transcribed and coded (questions on definitions, challenges and goals), and notes were taken to support the conclusions. 23 codes and 79 different sub-codes were used for data coding. The codes (with their respective sub-codes) were extracted from previous works (Fernandez-Anez, 2016; Fernández-Güell et al., 2016) (11 codes), from the theoretical basis of this work (6 codes) and from data (6 codes). The main results were the modification of the model

according to the results of these nine interviews to obtain the final vision presented in this paper, and the definition of the interviews and surveys to apply the model.

Figure 33: Research structure (previous steps in grey colour). Source: Author's own elaboration

Finally, the following research stages, explained in chapters 6 and 7, will be explained.

Application of the conceptual model to case studies is explained in chapter 6 (the next chapter). The model was applied to the Smart City strategies to compare the past and ongoing implementation of the initiative and the discourses of relevant stakeholders on the concept and the initiative. The summary of the number of interviews and projects analyzed is synthetized in table 17.

The past and current projects in the municipal strategy for the implementation of Smart City were analyzed in terms of the stakeholders, type of projects developed and the challenges and the global trends they were addressing (See annexes 2, 3 and 4 for the complete details).. The information was extracted from the official websites of the analyzed strategies. For this reason the dates are not the same in all cities, depending on the availability of documents and the time frames of the research. The Information was extracted on (a) the project stakeholders, (b) the projects in each dimension, and (c) the challenges and trends addressed by the projects.

		Projects		Coincident projects	Total number of projects per city	Interviews
		Before(	now			
Prevalidation						9 (May 2016)
Validation	Vienna (2016-2018)	64	83	45	102	14 (June 2016)
	Milan (2013-2017)	77	44	18	103	16 (February 2017)
	Barcelona (2015-2017)	76	39	10	105	15 (June 2017)
	TOTAL				310	54

Table 17: Number of analyzed projects and interviews stakeholders in each phase and city, and dates.

Source: Author's own elaboration

To study the stakeholders' visions, a new sample of interviews (Interviews II) was conducted following the methodology used in the pre-validation, modified by incorporating the lessons learned in the previous phase. The interviews took place between June 2016 (The first ones in Vienna) and September 2017 (the last ones in Barcelona) (See Table 17 and see annex 1 for the complete list of interviewed experts). A combination of fixed and open questions in a semi-structured interview was mixed with a survey in which respondents were asked to provide their own definitions of the Smart City concept and answer a similar set of questions to the previous phase. The two main additions were a new question on other relevant stakeholders to identify the respondents' view of the main agents involved in the initiative; and a survey with scores of 1 to 5 for each challenge in Table 2 (Section 3.3) to determine the importance of the challenges and trends. The sample consisted of 14 to 16 interviews with relevant stakeholders in each of the analyzed cities. The stakeholders were selected following similar criteria to the previous phase from among experts in the various institutions participating in the municipal strategy. A

new selection criterion was their involvement in the local Smart City strategy. The participants in the Smart City projects were analyzed and selected according to the number of projects they were involved in, together with the two criteria described in the pre-validation stage. Data was collected as in the previous phase. Data analysis and coding consisted of partially analyzing the interviews (definitions) through text analysis techniques following the methodology described in the pre-validation phase. The survey results and stakeholders' identification were classified, and conclusions were extracted. Three types of results were obtained: the identification and classification of the stakeholders in the initiative into groups (quantitative/qualitative); the survey results (quantitative); and the identification of the terms corresponding to each dimension from the analysis of the Smart City definitions (qualitative/quantitative). This last step allowed the qualitative information to be transformed into quantitative information. These results are used to modify the conceptual model. Further conclusions can be drawn from the complete analysis of the interviews and will be described in future work.

At the end of chapter 6, guidelines for European Smart Cities are extracted. The analysis of the implementation was compared with the discourses of the relevant city stakeholders and conclusions were drawn. The result consists on a proposal of guidelines for a Smart City Strategy that narrows the gap between the visions of the different stakeholders with the actual implementation of the strategy.

Finally, Chapter 7 presents the conclusions of this research (stage 6). According to the questions formulated in chapter 1 and the topics explored in the State of the Art (Chapter 2 and 3), conclusions were classified into three groups:

- Conclusions about the conceptual model
- Conclusions about the use of the tool
- Conclusions about the analysis result

As a result, the research hypothesis is (or not) validated and the research questions answered.

5.2. Pre-validation

For the validation of the proposed model, 9 experts were interviewed in order to gather the points of view of members of the different stakeholders' groups (at least 2 members per group) (see table 18). The experts are specialists in the different Smart city dimensions and the transversal areas of Technology and Planning. We chose experts that belong to International and local governmental institution, Universities and Research Centers, Private companies of different sized and International and national ONGs. Interviewed experts come from Spain, Austria, Luxembourg and Paris. Table 19 presents the complete results of the interviews.

		Governmental Institutions	Private Companies	Universities and Research Centers	Civil Society
Dimensions	Governance		(3) Integrated Urban Regeneration, Lead Researcher. TECNALIA Research & innovation Sustainable Construction Division;. Bilbao, Soain	(	
	Economy	(1) Engineer, Urban division, EIB, Local Government. Luxembourg, Luxembourg			
	Environment				(9) vocal and activist, Ecologistas en Accion, Madrid, Spain
	Mobility		(4) Technical Director, B-us. Madrid, Spain		
	People		(5)Co-founder&CMO of @Hackity.	(7) Independent researcher at Urbano Humano. Paris, France	
	Living				(10) Innovation projects Director, TECSOS Foundation (Red Cross + Vodafone). Madrid, Spain
Transversal subsystems	Technology	(2) Innovation Program Manager at Zaragoza's City council. Zaragoza, Spain	(6) business developer executive in Energy and Smart cities, IBM España. Madrid, Spain		
	Planning			(8) Head of the Centre of Regional Science, Department of Spatial Development, Infrastructure and Environmental Planning, Vienna University of Technology. Vienna, Austria	

Leonor Berriochoa; (2) Daniel Sarasa; (3) Patricia Molina; (4) Samir Awad; (5) María Isla; (6) Enrique Díaz-Plaza, (7) Domenico DiSienna; (8) Rudolf Giffinger; (9) Cristina Fernández ;(10) Ana Peñalver

Table 18: Experts interviewed in the Pre-Validation phase. Results in Table 19. Source: author's own elaboration

Interviewed experts were selected in order to address all dimensions and all stakeholders groups. The criteria was a web and literature review. Experts that were publishing or developing projects on the field and were accessible to the author were selected. Regarding the hierarchy, all interviewed experts were considered to have the same importance.

Interviews were divided in 3 parts. On the first one, general questions about the concept of Smart City are posed to extract conclusions about the way they understand Smart Cities, Smart City Projects, and the goals and challenges that cities must face today. On the second part, experts are faced to the model to contrast their previous expressed opinions with their Conceptual model. On the final part, conclusions are extracted about the Conceptual model and its possible uses.

Looking at the answers provided, we can notice that their definitions for Smart City present are different, but also present a set of common points. Definitions provided by governmental institution focused on solutions and results. Technology was perceived as a tool in most definitions. People and participation was a cross-cutting issue among definitions provided by all groups with the exception of private companies, more driven by the idea of efficiency and management. An interesting outcome is that environmental focus was only present in two definitions.

The general opinions of interviewed experts about the Smart City has been analyzed through text analysis techniques (Graph 1). Technology terms have been the terms used with a higher frequency in the interviews, either directly or by any element (ICT or referred as technological tools). Innovation as a tool in the smart city has been the 3rd group of words in importance (innovation, new, innovative, etc.) The second group of terms in importance have been the ones related to people (people, human, citizens). Regarding the 6 dimensions defined by (Rudolf; Giffinger et al., 2007), People has been the most cited one, followed by Governance terms (participation, stakeholders, actors, management). Finally, regarding the goals for the Smart City, solving current challenges has been the main goal described, followed by increasing efficiency.

Daniel Sarasa Urban innovation program Manager at Zaragoza's city council	Una smart city es cualquier ciudad, es cómo las ciudades encuentran soluciones a sus problemas en cada momento. Analizar bien los problemas en que esta al alcance. La tecnología puede estar asociada o no. La capacidad de las ciudades de aprender y no cometer los mismos errores, propios y ajenos (aprender de uno mismo y del vecino)
Patricia Molina Costa. Integrated Urban Regeneration, Lead Researcher. TECNALIA Research & innovation Sustainable Construction Division	A smart city makes the most of existing technology tools to make cities more efficient in the way it uses its resources. Apply technology and innovation to city processes to achieve efficiency of natural resources and environmental and monetary resources
Samir B-us Director	La Smart city no como objetivo sino como concepto: una nueva forma de gestionar las ciudades, más que tecnificarlas: Planificación, medidas-segumiento. Cambia el patrón de modo que en la estrategia entre en juego la obtención de datos.
Cristina Fernandez. Ecologistas en Accion Madrid.	A city that has incorporated technological elements for planning and collecting data, that includes ICT.
Rudolf Giffinger. TU Wien	A smart city is a city which is open to new trends and challenges (forward looking) and able to discuss and tackle problems. This process should foster participation to make it more sustainable. Thus, is a mixture of problem driven and target driven: to change urban life in front of climate change.
Ana Peñalver Directora Proyectos de Innovación Fundación Tecos	A Smart City is a city which is adequate and adapted to people's capacities. Technology must play a role: to be extension, to make things reach people in an adequate way.
Domenico di Sienna	A more human city. A more human city is a smart city. Revise the smart city concept and put people in the center. We provide technology for this, citizens are active stakeholders. People as major actors of territories. Technology is something that helps us to develop collective intelligence.
Leonor Berriochoa Urban division, EIB	Smart city is a sustainable city plus additional components: 1. Public participation. 2. innovation: through technologies or even through this participation. 3. Integration: energy, urban, water, recycling, etc. Producing synergies and direct results i.e. sports centre which is used as a teching centre.
Enrique Díaz-Plaza Sanz Responsable de Desarrollo de Negocio Sector Energético y Smart Cities, IBM España	Smart City means habilitating something for the future. It is the efficient management of TICs units. It emphasises the use of technology to make better cities through TICs, Electronics, IoT...

Table 19: definitions provided by the interviewed experts. Source: author's own elaboration.

Graph 1: Terms in Smart City definitions by interviewed expert. Source: Author's own elaboration.

Graph 2: Approach to technology in the definitions. Source: author's own elaboration.

Technology terms have been the ones appearing with a higher frequency in the definitions (Graph 2). However there are very different points of view about it. 8 out of the 9 interviewed expert have mentioned technology in their definitions. 6 of them consider technology necessary in a Smart City, and 3 of them don't. When talking about technology, the wide term of "technology" has been the one used a higher number of times. When referring to technology, it was understood as a tool more than half of the times. ICT has been used just 3 times, among the interviewed experts.

When asked about the main objectives that a Smart City pursues, the topics related to governance (participation, decision-making, bottom-up, stakeholders involvement, democratic improvement, etc.) were the ones appearing with a higher frequency, and most of the times seen as the key tools to get the goals (Graph 3). Was followed by two groups of terms, the ones related to solving urban challenges (solutions, challenges, problems, opportunities, impacts, needs, etc.) and to increasing efficiency in the city (mostly addressed by the term itself). The next two groups are related to the Smart City Dimension, where Governance has been followed in importance by the groups of terms related to Environment and People. Sustainability terms would be group following in importance. Technology and innovation plays in the objectives description a secondary role, confirming that they are understood like tools for getting the

objectives. Also mentioned 4 times, getting a holistic approach to the city has been highlighted. Quality of life, which is the most frequently goal reflected in literature (Caragliu & Del Bo, 2012; Rudolf; Giffinger et al., 2007; Nam & Pardo, 2011b) has not been mentioned as the main goal by most of the experts. There is also a group of spatial terms, related to the spatial aspect of the smart city: planning, urban, territory, place-based solutions or global perspectives.

Graph 3: Terms appearing in the descriptions of the objectives of the Smart City provided by the interviewed experts. Source: author's own elaboration

When it comes to the challenges identified by the interviewed experts, they have been classified in the groups determined by the literature review in order to validate the classification and include modifications. The interviewed experts have cited climate change and social polarization as the main global trends affecting to European Cities. Challenges included in global urbanization have also been mentioned by most of them (Graph 4 and 5). The challenge “1.2 Increasing resilience in resources management and fostering circular economy” has been the most mentioned challenge. Even if Mobility has not been mentioned in the previous stages, 5 challenges cited by experts can be included in “4.5. Fostering sustainable accessibility in cities and promoting sustainable, inclusive and healthy mobility”. Other important identified challenges that group 4 of the challenges cited by the interviewed experts have been 2.1., 2.2. and 3.2. (See table 18). However the most important conclusions is that challenges described by interviewed experts can be included in the existing trends (with the exception of 1) and in the identified challenges. Only 7 out of 60 cannot be directly included in the challenges and 6 of this 7 can be included as global trends.

Graph 4: Global trends in the descriptions of the challenges for cities according to interviewed experts.
Source: author's own elaboration

Graph 5: Challenges appearing in the descriptions of the challenges that cities must face by the interviewed experts. **Source: author's own elaboration**

The result of the analysis of the introductory questions and the direct opinions expressed by the interviewed experts have led to important changes in the model.

Among all interviewed experts, there was a consensus in placing the stakeholders at the core of the model. However, there were two elements generating discussion in this first model. The first one was the core being named as “demand”. The model was explained as based in a “supply and demand” structure, but it was something interviewed experts did not find useful in the Smart City Framework. Besides, they did not find “Citizens” clearly situated in the model, even if they constituted the core of the demand. The analysis of the definitions provided by the experts has reflected the importance of the terms related to “People” not only as a part of the Smart City, but as a key element at the core of it. Therefore, the term “Demand” has been changed by “Citizens” in a language closer to the ones used by the experts (Fig. 34). The second point that

was not clear was the understanding of the subsystems and the stakeholder's groups operating inside them as separated. Therefore, they have been overlapped among them and linked by "Citizens".

The analysis of the definitions and Smart City objectives described in the interviews has highlighted the importance of focusing on solving challenges as a key objective of the Smart City. However, there was a lack of understanding on the idea of having internal and external challenges. On the way experts have defined the challenges, groups could be identified that correspond to global trends in the second scale. There was a relationship among internal and external challenges. Therefore, internal and external challenges, from which the difference was unclear, has changed to global trends and urban challenges.

Governance terms were the most used in the description of the objectives of the Smart City. It was linked to the solution of urban challenges, seen in most cases as the mean to get to address them. Therefore, in the second version of the model, governance has been placed as an element that supports the urban challenges and is the mean to transform them into a Smart City solution. Regarding the Smart City Dimensions, which aim to group the Smart City Projects provided by the strategy in a systematic way, there was difficulties of understanding. There was a problem with differentiating the subsystems (environmental, or citizens) from the Smart city solutions. Therefore, they have been named as "initiatives" in order to facilitate this distinction. Specific problems with naming were appearing at "living" which has been changed to "living and services", and in mobility, a term that was not wide enough (it has been mentioned just once in the analysis of the definitions) and has been changed to "mobility and infrastructures".

Other topics that appeared in the analysis of both definitions and descriptions of the objectives of the Smart City was the idea of the impacts or results of the Smart City, especially by definitions provided by governmental institutions. Therefore, the understanding of the impacts of the Smart City as a double arrow was highlighted. This arrow should connect stakeholders' groups and also citizens directly with the Smart City.

The analysis of the definitions has pointed out that technology is a key element of the Smart City in a wide sense, and not only as ICT or communication technologies. It also has confirmed the idea of technology acting as an enabler of the Smart City and not as an objective by itself. Therefore, the place and role of the technological subsystem in the model has been confirmed.

The Smart City was described at the beginning of this section as the confluence of the Spatial Subsystem and the Technology Subsystem. However, the prevalence of the Governance as a support for the other dimensions in the first model did not allow to recognize this fact. The interviews have highlighted the importance of spatial terms regarding the objectives of the Smart

City. Therefore, in the second version of the model, the Spatial Subsystems plays again an important role as basis for the Smart City (Figure 34).

Figure 34: First version of the model and modified version. Source: author's own elaboration.

Interviewed experts were at the end asked about the possible uses of the Conceptual Model by different stakeholders' groups (graph 6). They found the model especially useful for governmental institutions and companies. For governmental institutions, the proposed use was for Smart City strategy proposals and for management of the ones under development. Its use as a descriptive tool in order to get a holistic overview was also highlighted. The ideas were mainly linked to its use by local governments. The linkage to an assessment tools that uses measures was proposed by 2 of the experts too. For companies, the proposed use was to design market strategies, for fixing the fields to work in and for increasing resources efficiency. They found it also useful for research, mainly as a departure point for further research. Only three of them found it to be a useful tool for communication with civil society (among them, interviewed Civil Society members) and 2 of them suggested to simplify it in order to be useful. Therefore, the wider possibilities were proposed at the use by governmental institutions, mainly local

governments. Therefore, in the next section, the model is going to be applied to a Smart City strategy developed by a local government.

Graph 6: Possible use of the Conceptual model by different groups of stakeholders. Source: author’s own elaboration.

CHAPTER 6. CASE STUDIES

CHAPTER 6. CASE STUDIES

This chapter resumes the application of the proposed conceptual model to a selection of case studies. The analysis of the case of Vienna was published in the article “Smart City implementation and discourses: An integrated conceptual model. The case of Vienna.” in the scientific journal “Cities” (See Fernandez-Anez et al. 2017). This chapter presents new insights into the analysis of Vienna including an actualized revision of the strategy. The initial insights on the interviews, taking as a departure point a tentative model, were presented in the paper “Ciudad inteligente y vision integrada: Barcelona, Milán y Viena”, presented in the conference IV Congreso Ciudades Inteligentes in Madrid, 2018. See Annex 6 for the complete documents-

Case studies selection

For the selection of case studies in this research, two ideas have been taken into account. First of all, the idea of a holistic approach to the concept of the Smart City. Secondly, the idea of the real implementation of the Smart City through projects as key for the evaluation and assessment of initiatives.

In chapter 3 we have described the work Mapping Smart City in the UE (Manville, 2014). This work combines the idea of a holistic approach with the idea of the implementation of Smart City programs through projects (which in the referred document are named after “initiatives”). This work included an analysis of cities clustering them according to the number of Smart City initiatives and the number of characteristics per initiative (the holistic approach of each initiative, reaching one or more than one are among mobility, environment, economy, governance, people and living) This analysis has led to the creation of four clusters, according to the level of complexity of the Smart City Program (Fig. 35).

The first cluster is the cluster with a higher level of complexity: it reflects a complex Smart City program with both a high number of initiatives and a high number of characteristics per initiative. It includes cities like Amsterdam, Helsinki, Oulu, Barcelona and Hamburg.

The second cluster is focused on the number of characteristics per initiative (the complexity within each initiative). These cities have a smaller number of initiatives but with a high internal complexity, they reach at least more than 2,25 characteristics on average per initiative among governance, economy, environment, mobility, people and living. Cities included in this group are Lyon, Tirgu Mures, Glasgow, Tallinn and Vienna.

The third cluster is focused on the number of initiatives, having a high number of initiatives with not a high level of complexity within each initiative.

The fourth cluster have the lower level of complexity, having a smaller number of initiatives and, these initiatives reaching a smaller number of characteristics too.

Figure 35: Cluster analysis of Smart City initiatives and the number of characteristics per initiative. Source: Manville et al., 2014.

Among these cities we have selected the cities over 1 million inhabitants (Table 20).

	City	Inhabitants
Cluster 1	Amsterdam	810938 (2014)
	Hamburg	1746342 (2014)
	Helsinki	620715 (2014)
	Barcelona	1602386 (2014)
	Oulu	193798 (2014)
	Tirgu Mures	151129 (2014)
Cluster 2	Lyon	509233 (2013)
	Glasgow	598100 (2014)
	Tallin	411063 (2014)
	Vienna	1766746 (2014)
	Dublin	516255 (2011)
Cluster 3	Copenhaguen	559440 (2013)
	Manchester	517300 (2014)
	Milan	1324169 (2014)
	Malmö	302835 (2011)
	Athens	664046 (2011)
Cluster 4	Budapest	1744665 (2014)
	Eindhoven	220920 (2014)
	Ljubljana	285857 (2014)
	Bremen	548547 (2014)

Table 20: Inhabitants in the 20 cities included in the third phase of the study "Mapping Smart cities in the EU" (Manville et al., 2014). Data source: EUROSTAT, except for Lyon, INSEE. Source: Author's own elaboration.

Among these cities we have considered of interest the 3 first clusters because they all have a higher level of complexity, referring either to the number of initiatives or to their complexity. In the case of Barcelona and Hamburg, we have selected Barcelona because of its relevance in the international framework according to surveyed literature (Bakıcı et al., 2013; Capdevila & Zarlenga, 2015; Grimaldi & Fernandez, 2017; Tomàs & Cegarra, 2016).

As a result, the three selected cities are Vienna, Milan and Barcelona. Being each of them representative of one of the selected clusters of interest, the study considers them as an illustrative set of cities for the European Region. They all present differences and coincidences in their Smart City initiatives regarding the involved stakeholders, implemented projects and addressed challenges. The case studies will be analyzed in two different moments of time and compared to the opinion of stakeholders in each of the cities, following the methodology proposed in chapter 5. The results will lead to the development of guidelines for each of the cities. Taking as a basis the representative character of the analyzed cities, guidelines for Smart Cities in the European Region will be proposed.

6.1. The case of Vienna

The Vienna Smart City strategy was launched in 2011. In 2013, the municipality of Vienna started the strategic process by involving stakeholders from different municipal departments and various experts in the city. This process led to the “Smart City Wien Framework Strategy” in 2014 (City of Vienna, 2014), aimed at providing guidelines for the development of Smart City initiatives and projects until 2050. This strategy has three lines: “Quality of living”, “Resources” and “Innovation”, which structure specific associated topics and goals. The process of stakeholder involvement continued through a range of forums on topics related to the Smart City with different levels of success. The maturity of the project and the level of implementation and stakeholder implication led to the selection of Vienna as a case study for this research.

In April 2019 the Vienna Smart City webpage was consulted to analyze the 65 projects being developed at that moment (City of Vienna, 2016). The structure of the projects was divided into seven axes: Education and research; Health and social services; Building activity and living; Transportation and Urban Planning; Environment and climate protection; People and Society and Politics and administration/ICT (Tables 21 and 22). If we compare it to the proposal of Giffinger et al. (2007), the economy dimension does not appear and new dimensions, like education and research and health and social services, appear. Some other axes are renamed, as in the case of *governance*, that is named with the more limited name of Politics and administration, excluding other governance forms.

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Axe	Project
Education and research	1 URBEM – DK
	2 aspern.mobil - Mobility Lab in Seestadt Aspern
	3 PUMAS: mobility concept for the corridor Vienna - airport region
	4 ZENEM - future energy networks with electromobility
	5 Transform +
	6 CityKeys
	7 (Deutsch) Forschungsprojekt SMART.MONITOR
	8 Smart Cities Demo Aspern (SCDA)
	9 CASE - Competencies for A sustainable Socio-Economic development
	10 EU-GUGLE
	11 CLUE
	12 TRANSFORMAtion Agenda for Low Carbon Cities
Health and social services	13 e Health
	14 Mobile Health
	15 Seniorpad
Building Activity & Living	16 Boutiquehotel Stadthalle: City hotel with a zero-energy balance
	17 aspern Vienna's Urban Lakeside
	18 Kabelwerk
	19 Technologiezentrum aspern IQ
	20 Campus WU: Room for a University of the Future
	21 Hochbauten als Wertstoffquelle
	22 Marxbox: Austria's First "Green" Laboratory Building"
	23 Car-free Living
Transportation & Urban Planning	24 Bike City
	25 Energy-saving Tram
	26 Vienna Main Station
	27 Urban Development Plan 2025 (STEP)
	28 AnachB - smart from A to B
	29 Target area Liesing Mitte
	30 E-Taxis
	31 Citybike Vienna
	32 SMILE
	33 INWAPO
	34 Smart Hubs 2.0
	35 Optihubs
	36 Smart Services
	37 e-mobility on demand

Table 21: Projects and structure of the Vienna Smart City strategy (continues in table 16). Source: authors own elaboration from data of City of Vienna (2016)

Axe	Project
Environment & Climate Protection	38 CO2 neutral post Weatherpark - Windkomfort-Optimierung für den Stadtteil Hauptbahnhof
	39 Wien
	40 The MA 48 Waste App
	41 EcoBusinessPlan
	42 EOS – Energy from Sewage Sludge
	43 SternE – renewable energy in the main wastewater treatment plant
	44 ÖkoKauf Wien
	45 LED-Technik in der öffentlichen Beleuchtung
	46 Photovoltaik-Dachgarten
	47 Trinkwasserkraftwerke
	48 CC-Ware
	49 INNOSPIRIT
	50 Vienna Sewer Simmering
	51 IMPALA
	52 Programm "klimaaktiv erneuerbare Wärme"
	53 URBAN LEARNING
	54 Urban Mining
People & Society	55 Social City Vienna - Platform for Social Innovation
	56 Citizens' Solar Power Plants
	57 Wien Gestalten
	58 Urban Farming und Gardening
Politics & Administration/ ICT	59 Open Government Data
	60 wien.at Public WLAN
	61 DigitalCity.Wien
	62 Digitale Agenda Wien
	63 E-Government und Virtuelles Amt
	64 wien.at live-App
	65 Sondierung IKT-Integration für Gebäude und Stromnetz Wien-Aspern

Table 22: Projects and structure of the Vienna Smart City strategy (continues table 15). Source: authors own elaboration from data of City of Vienna (2016)

At the end of this study, in 2018, the Vienna Smart City webpage was consulted to check the evolution of the projects. The projects of the initiative are now organized into eight axes: Buildings, Digital, Energy, Environment, Health, Innovation, Mobility, Social affairs, Education and Location. The structure is similar now to how it was before, except for the exclusion of the Political axe (now called just digital) and the creation of new axes like innovation, energy and location. The webpage gathers information of 82 projects. The transversal character of the projects was recognized including them in more than one axe. The structure of the initiative has been summarized in tables 23 and 24.

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Projects	Buildings	Digital	Energy	Environment	Health	Innovation	Mobility	Social affairs	Education	Location
1 Neighborhood oasis								x		
2 Smarter together	x		x							x
3 Energy saving license			x	x					x	
4 WAALTER		x			x	x		x		
5 TREEDAY		x		x						
6 Optimal microclimate in Aspern				x						
7 Wien gibt raum						x		x		
8 Thematic city map "Energy"			x	x						
9 Wiener tafel								x		
10 Power-2-heat			x							
11 Blockchain in the energy sector		x	x			x				x
12 CORE-integration center								x		
13 Aspern Smart City research			x			x				x
14 Pocket Mannerhatten Ottakring	x							x		
15 Wienbot		x								
16 Smart Traffic lights							x			
17 Temporary offices buildings at Heldenplatz	x									
18 Leila				x				x		
19 Research projects unteres Hausfled	x			x		x				
20 Vienna research festival									x	
21 Green façades in Vienna	x			x						
22 Future jobs									x	
23 Co-creation lab in Vienna						x				
24 thinkport Vienna						x	x			
25 Energy from metro brakes			x			x	x			
26 Smart City Wien framework strategy monitoring			x	x		x				x
27 Smart Campus	x		x	x						
28 Sag's wien application		x								
29 ho ho vienna	x		x							
30 Dual infiltration model				x		x				
31 Vienesse campus model	x								x	
32 ViennaGreen CO2				x		x				
33 Digital city wien		x							x	x
34 wien.at public wifi		x								x
35 hanging gardens of Oberlaa				x					x	
36 Vienna sewer Simmerling				x		x				
37 Wind confort optimization at the Vienna central Station				x						
38 Digital Agenda Vienna		x								x
39 LED streetlights			x			x				
40 E-government		x						x		x
41 HEAT-re-USE Vienna			x			x				
42 Make your city smart						x		x		
43 Mischung possible	x							x		
44 "klimaaktiv renewable heating programme			x	x						x
45 Smart block step II Wien	x		x							x
46 Smart City in public housing						x		x		
47 Smart services	x		x							x
48 ICT integration Vienna Aspern		x	x			x				

Table 23: Project included in the Smart City Wien strategy (continues in table 18). Source: Author's own elaboration from the webpage of the initiative (Vienna, n.d.).

Projects	Buildings	Digital	Energy	Environment	Health	Innovation	Mobility	Social affairs	Education	Location
49 Urban learning			x						x	x
50 CC-Ware				x						
51 wien.live. App		x						x		
52 E-taxi Vienna			x				x			
53 university of economics WU campus	x					x			x	x
54 Wien gestalten								x		
55 e-health		x			x			x		
56 drinking water power station			x	x	x					
57 photovoltaic roof garden			x							
58 Social city Vienna								x		
59 technology centre seestadt	x		x			x				
60 ecobuy vienna				x		x				
61 mobile health		x			x			x		
62 Smart Cities Demo Aspern (SCDA)						x				x
63 smart from A to b		x					x			
64 kabelwerk	x									
65 high rise building as source of recyclable materials	x			x						
66 Urban farming and gardening				x				x		
67 Boutique hotel stadthalle	x		x							
68 Bike city				x			x			
69 EOS			x							
70 The MA48Waste app		x		x						
71 Aspern's Vienna urban lakeside										x
72 Open government data		x								x
73 CO2 neutral delivery			x	x			x			
74 Eco business plan				x		x				
75 Vienna central station							x			x
76 City bike vienna							x			
77 Marxbox						x				
78 Urban mining				x		x				
79 Sterne			x							
80 STEP urban development plan 2025										x
81 Citizen solar powerplants			x	x				x		
82 Car free living				x			x			

Table 24: Project included in the Smart City Wien strategy (continues table 17). Source: Author's own elaboration from the webpage of the initiative (Vienna, n.d.) consulted in 2018..

Regarding governance, the Vienna Smart City strategy is directed by the urban planning department, the MA 18 Municipal Department of urban development and planning, and TINA Vienna, the Smart City agency and energy center. Other departments involved are MA20 (energy), MA21 (district and land planning) and MA22 (environmental protection). For the

development of the Smart City Wien strategy, around 100 agents were involved, mainly belonging to the departments of the municipality but also smaller shares of knowledge and economic agents and an even smaller share of a social organizations. The strategy has a strong leadership that did not change during the last years.

Two and a half years after the publication of the strategy document, the conceptual model proposed in Chapter 5 was applied to this case study to compare the projects developed in the Smart City strategy with the opinions of the different stakeholders. This work was. Guidelines were then proposed for a revision of the strategy. These propositions evidently do not only focus on attaining the objectives, but also on increasing the engagement of the various stakeholder groups as the key to success in developing future projects. The methodology therefore compares the analysis of the Smart City projects implemented in Vienna and the results of the interviews and surveys with 14 key stakeholders in the city.

Following the methodological considerations in Chapter 5, the following steps were taken to compile the empirical evidence and modify the conceptual model:

In the first stage (6.1.1.), the conceptual model must be modified to include the various city stakeholders. The number of stakeholders per project in each subsystem (political, knowledge, social and economic) (Figure 37, implementation), and the number of stakeholders mentioned in the interviews are indicated (Figure 37, discourses).

It is crucial to compare two aspects, namely which dimensions are being affected by current projects (Fig. 38, implementation), and the key elements of a Smart City according to the stakeholders, so they can be classified into different dimensions to reveal their relative importance (Fig. 38, discourses). The number of projects affecting each dimension is then compared with the terms used in the definitions given by the stakeholders in their interviews, producing two different versions of the model (6.1.2).

The number of projects addressing each challenge and trend (columns) was compared to the survey results regarding their importance in the case of Vienna (points) (Graph 1) in section 6.1.3.. The results of global trends will be analyzed explicitly, and the results of specific challenges will be used to support the guidelines in Section 6.1.4.

The modifications of the model are described from the center to its outer limits in order to aid its understanding. The final phase presents a synthesis of all the modifications to the conceptual model (Fig. 41). This model combines the three analyses (stakeholders, projects and dimensions, and challenges) and establishes relationships between the elements. It is important to note that this visualization shows the relative weights of each of the three parts of the analysis separately (stakeholders, challenges and projects and dimensions), not allowing numerical comparison.

6.1.0. Interviews development and analysis

The model was applied to the Vienna Smart City in order to compare the ongoing implementation of the initiative with the discourses of relevant stakeholders on both the concept and the initiative.

The current projects in the municipal strategy for the implementation of the Smart City were analyzed in terms of the stakeholders, type of projects developed and the challenges and the global trends they were addressing. A total of 64 projects were analyzed according to the official site (City of Vienna, 2016). Information was extracted on (a) the project stakeholders, (b) the projects in each dimension, and (c) the challenges and trends addressed by the projects.

The sample for the case of Vienna consisted of 14 interviews with relevant stakeholders in the city of Vienna. The complete results can be seen in Annex 2. The stakeholders were selected following similar criteria to the previous phase (Table 25) from among experts in the various institutions participating in the municipal strategy. A new selection criterion was their involvement in the Vienna Smart City strategy. The participants in the Vienna Smart City projects were analyzed and selected according to the number of projects they were involved in, together with the two criteria described in the pre-validation phase. Data was collected as in the previous phase.

		Government institutions	Universities and research centers	Private companies	Civil society
Dimensions	Governance	(1) Member of Parliament for Vienna - Member of the Social City Wien Expert Advisory Board;	(6) Research Institute for Urban Management and Governance. Head of Research Institute. Professor at the Vienna University of Economics and Business		
	Economy		(7) Research Area Leader, Institute for Ecological Economics. Professor at the Vienna University of Economics and Business.		
	Environment	(2) Public Affairs Management of TINA VIENNA Urban Technologies & Strategies GmbH	(8) Senior Research Engineer. Energy Department. Sustainable buildings and cities. Austrian Institute of Technology.		
	Mobility		(9) Researcher at the Institute of Transport Science, Vienna Technical University.		(13) Member and resident of the car-free district
	People	(1) Member of Parliament for Vienna - Member of the Social City Wien Expert Advisory Board;			(14) Head of Wiengestalten, Dialogplus
	Living	(3) Head of Department MA23- Economics, Labor and Statistics			(15) Economist and head of the municipal policy department at the Vienna Chamber of Labor.
Transversal subsystems	Technology	(4) Responsible for the Digital Agenda Vienna. Office of the CIO of Vienna City Council		(10) R&D Manager at Siemens AG Austria.	
	Planning	(5) Director of Urban Planning at Vienna City Council		(11) Expert in urban and regional development and regional economics at the Austrian Institute of Spatial Planning (OIR) (12) Project manager Environmental Impact Assessment and transport, Wien 3420	
(1) Tanja Wehsely; (2) Dominic Weiss; (3) Klemmens Himpele; (4) Michael Hagler; (5) Thomas Madreiter; (6) Verena Madner; (7) Christian Rammel; (8) Hans-Martin Neumann; (9) Paul Pfaffenbichler; (10) Herwig Schreiner; (11) Christof Schremmer (12); Lukas Lang; (13) Michaela Stumpf; (14) Peter Kuhnberger; (15) Thomas Ritt.					

Table 25: Selection of stakeholders in Vienna, according to three criteria: they belong to different stakeholder groups; they specialize in different Smart City dimensions and in the transversal areas of technology and planning, and the number of Vienna Smart City projects the stakeholders are participating in. See Annex 2 for complete results of the interviews. Source: Author's own elaboration.

Interviewed stakeholders faced an initial model of the Vienna Smart City strategy that was modified according to the number of projects developed in the different dimensions. (Fig. 36). For the development of this model the projects included in the Vienna Smart City strategy were classified into the different dimensions. When affecting more than one dimension, they were divided into main ones and secondary ones. The size of the dimensions was modified according to the total number of projects in each of the dimensions, but the numbers that figure in it correspond to the number of projects that had this area as the main dimension with respect to

the total number of projects related to this dimension (fig. 27). For example, for Environment SC initiatives, 41 projects were mainly focused on this aspect, but if we take into account the projects that were also taking into account Environment in a secondary place, the total number of projects will rise to 53. (This was hard to explain to stakeholders and this classification was eliminated).

Figure 36: Vienna conceptual model as presented to stakeholders in the interview. Source: Author's own elaboration

The idea of projects addressing one dimension in first place and others in second, represented in the complex model, was difficult to follow by the interviewed stakeholders, and was eliminated in the research in the other case studies.

Interviewed stakeholders provided their own definitions of the Smart City (see tables 26 and 27) and about their opinion on other stakeholders involved and challenges (See Annex 2).

Christian Rammel, WU	I do not have a specific definition. Humans always need some names, it could be a fair city, whatever. It must be a sustainable city. It must have smart ICT. Smart technology is something that strength and support the shift from citizen to consumer. It means sustainable and fair urban development: social dynamics, knowledge alliances, participation, learning processes...
Christof Schremmer-ÖIR	A Smart city is not just technology, but socioeconomic and environmental sustainability, sustainable smart cities. Smartness means better: better use, much better governed. People together and efficiency
Dominic Weiss, TINA	Smart City is a combination of challenges, growth and urbanization are key and cities give solutions; challenges like globalization, urbanization or climate change. It must face the challenges together in a holistic approach Framework. You could name it XXX, a future orientated solution how we want to tackle the future. A smart city must break up borders of the departments, all departments are able to take part, one plan for all.
Herwig Schreiner, Siemens	A smart City is more than info boards and intelligent building. It means inter-modality (energy, mobility government) and crossing the silos: integration. It means sustainability of infrastructure thinking on the future. Citizens must get quality of living. There must be knowledge sharing and additional knowledge for everybody. There should be more than data.
Klemens Himpele, MA23.statistics	A smart city is a city able to give the best quality of life for all people in the city (not just some) using less resources. It is not about technology, people is in the center, getting quality of life, work, etc., of the best quality.
Lukas Lang- Wien 3420 AG	A smart city is challenging the questions of the future (every city) combining the technology and the knowledge of all citizens. Vienna has 1,8 millions brains, to use the knowledge of all society to challenge future questions.
Michael Hagler, Digital Agenda Wien	A smart city is transparent and participation is key, it must be developed together with people. Techniques is a way to reach the goal. Think out of the box, open for new products, innovation is key. It must be citizen orientated. Trust and security aspects must also be in the focus as obliged by the state.
Michaela Stumpf, Car free district	A city where people feel comfortable to live, live together, use shared facilities. Not having a car, each person should use public systems. Quality of living in housing without spare space, well distributed. To have the things you need near: facilities, public services.
Paul Pfaffenbichler,TU	A Smart City fulfill needs of citizens: no much energy, no much pollution and sustainability. It is more than ICT to organize the city. A central pint is energy consumption and resources. It needs to be smarter in managing. And regarding transport, it means the traffic organizing itself. It must be smarter than ICT.
Peter Kuhnberger, Wiengestalten	Smart city is where people strengths are integrated, where people has the chance of self-empowerment, to adapt and use the city through themselves. . Where the strength and resources of people are used for the common welfare. It must have a social approach but technology can help. There is a participation in city development and an acquirement of the city. (i.e. find lost places, changing pavements...) feeling that the city is yours. That you have both right and a role in the city. Participation from the administration and technicians to organize peering. To foster the use of open data; to participate in the value of data; to make living easier and more transparent.
Tanja Wehsely, Social city wien	A smart City is not only transport or technology, it has a strong social background in which investment in labor market, education, youth, gender sensitivity, social infrastructure... producing inputs into health, social affairs.

Table 26: Definitions provided by stakeholders intervied in Vienna (Continues in table 27). Source: author's own elaboration.

Thomas Madreiter, Director of Urban Planning at Vienna City Council	Smart is a buzzword. A smart city must be sustainable, smart is a method to achieve sustainability. Innovation and technology must be understood as enablers, no as an answer by themselves; beginning the process in the urban planning department, using urban planning method. Finally, a social approach: putting the citizens in the center. When the level of technology is too high it is not convenient
Thomas Ritt, Arbeitskammer	Smart city is only a word, is nothing but sustainability, in Vienna combined with city marketing. They put old programs and good things together but there is no need of Smart City, sustainability is enough, there is no need of the concept.
Verena Madner, WU	A Smart city must have ambitious goals regarding CO2 and new technologies. These goals are climate change policies and how they affect people regarding social inclusion and social innovation, and the other way round (loop). All these in and up to date interpretation of systemic urbanism.

Table 27: Definitions provided by stakeholders interviewed in Vienna (Continues table 26). Source: author's own elaboration.

Graph 7: Classification of terms included in Smart City definitions by interviewed stakeholders in Vienna. Source: Author's own elaboration.

In the analysis of the interviews (Graph 7) we can see that the concepts that appear as the most relevant are the ones relate to *governance*, *people* and *living*. The idea of city is frequently mentioned. Concepts related to technology are also important, as well as some of the objectives of the Smart City.

Regarding the objectives that a Smart City should have, accessibility has an important weight in the definitions, followed by sustainability and resilience, integration and holistic view and facing urban challenges. Quality of life or the idea or improvement are also present in the definitions.

Regarding technology, interviewed experts have a wide view of it, not include only ICT. More than half of the interviewed experts have highlighted that the Smart city is not only technology. Innovation have a crucial role in their definitions.

The dimensions that have been highlighted by experts are *governance*, *people* and *living*, while *environment* and *mobility*, and especially *economy*, seem to be less important in their definition of the Smart City

6.1.1. Subsystems and stakeholders in the Vienna Smart City initiative

The public sector unquestionably takes the central role in the strategy in both models (Fig. 37). The combination of public companies, municipal government departments and national companies in the political subsystem conforms the largest stakeholder group. Municipal government members had the same weight as public companies in these groups, although public companies were mentioned less frequently as key stakeholders. There is some disagreement in regard to the other stakeholder groups. The stakeholders interviewed made more frequent mention of members of research institutions than of private companies. However, the project analysis revealed that far more private companies are involved in the projects than universities and research centers. Both the implementation and stakeholder discourses on the strategy agree that civil society is not involved in the Vienna Smart City. The complete analysis of results is included in Annex 2.

IMPLEMENTATION (before)

IMPLEMENTATION (now)

DISCOURSES

Figure 37: Conceptual model. Stakeholders involved according to the project analysis (implementation) before (2016) and now (2018), and the interview analysis (discourses). Source: Author's own elaboration.

6.1.2. Vienna Smart City projects and dimensions

There are common points and differences between these three versions of the conceptual model in terms of the importance of the dimensions (Fig. 38 and 39 and Table 28). To see the complete analysis of projects for Vienna, please see Annex 2. The greatest number of projects address the *environmental* dimension, which is the fourth most important in the stakeholders' definitions. *Governance* is the most important dimension in these definitions, followed by *people*. These dimensions are second and third in regard to number of projects, so there is some coincidence between discourses and implementation. *Living* comes next in the discourses, and is the fifth most important dimension according to the number of projects affecting it. The experts interviewed did not often mention *mobility* topics, although it is an important feature of the Vienna Smart City Strategy. Both results show a low weight for the *economy* dimension in the Vienna Smart City. The terms relating to this dimension are the least mentioned by the stakeholders and it is the one addressed by the fewest projects.

Environment keep on being the most important although a little bit more balanced. Increases importance of *Governance* (slightly), *living* and *economy*. *People* slightly decreases, *mobility* decreases in a significant way.

IMPLEMENTATION (before)

IMPLEMENTATION (now)

DISCOURSES

Figure 38: Conceptual model modified according to the number of projects in each dimension (implementation) before (2016) and now (2018), and the terms appearing in the Smart City definitions by different stakeholders (discourses). Source: Author's own elaboration.

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

The table is a matrix where rows represent individual smart city projects and columns represent specific dimensions and project actions. The dimensions are categorized into six main groups: Smart Governance, Smart Economy, Smart Mobility, Smart Environment, Smart People, and Smart Living. Each group contains several sub-dimensions or project actions. The cells in the matrix are colored to indicate which projects are associated with which dimensions. For example, projects like 'Smart City Lab' and 'Smart City Hub' are associated with Smart Governance and Smart Environment. Projects like 'Smart City Living' and 'Smart City People' are associated with Smart People and Smart Living.

Figure 39: Image of the classification table for the project actions of Vienna. See Annex 2 for more details.
Source: Author's own elaboration

		BEFORE	NOW			BEFORE	NOW
Smart Governance	SGo1. Participation	24	31	Smart Environment	SEn1. Network and environmental monitoring	6	5
	SGo2. Transparency and information accessibility	6	12		SEn2. Energy efficiency	38	40
	SGo3. Public and Social Services	7	7		SEn3. Urban planning and urban refurbishment	19	27
	SGo4. Multi-level governance	6	2		SEn4. Smart buildings and building renovation	19	25
	SGo5. Community building and urban life management	8	25		SEn5. Resources management	23	33
	SGo6. Efficiency in municipal management	14	14		SEn6. Environmental protection	5	6
Smart Economy	SEc1. Innovation	12	24	Smart People	SPe1. Awareness rising and behavioural change	16	29
	SEc2. Entrepreneurship	7	10		SPe2. education and digital training	15	20
	SEc3. Local & Global interconnectedness	1	3		SPe3. Research	21	13
	SEc4. Productivity	1	4		SPe4. Creativity	1	5
	SEc5. Flexibility and conciliation in labor market	1	1		SPe5. ICT - Enabled working	2	2
Smart Mobility	SMo1. Accessibility	13	5		SPe6. Inclusive society	8	15
	SMo2. Clean, non-motorised options	17	14	Smart Living	SLi1. Culture and leisure	11	18
	SMo3. Public Transport	20	13		SLi2. Healthcare	9	9
	SMo4. Multimodality	17	7		SLi3. Security	5	6
	SMo5. Logistics	14	8		SLi4. Technology accessibility	8	11
	SMo6. ICT Infrastructure	11	8		SLi5. Welfare & Social inclusion	13	18
	SMo7. Traffic management	12	7		SLi6. Public spaces management	13	22
					SLi7. Tourism	4	4

Table 28: Classification of Vienna Smart City projects before (2016) and now (2018) by project actions following the methodology proposed by Fernandez-Anez et al. 2018. Source: author's own elaboration.

6.1.3. Global trends and urban challenges for Vienna

Graph 8: Comparison of the number of projects addressing each challenge and trend (columns; left y-axis: number of projects addressing each challenge or global trend) in the analyzed time frames, and the results of the survey of their importance in the case of Vienna (points; right y-axis: importance value provided by experts (1-5)). Source: author's own elaboration

The comparison of the results of both groups of trends and challenges in Graph 8 shows agreement on *climate change* as the most important global trend, but a strong disagreement between the experts' opinion and the number of projects dealing with *social polarization* and *economic instability*. In the project analysis, this global trend is closely followed by *global urbanization*, while there are fewer projects to tackle *economic instability*. *Social polarization* and *need for new governance models* come after *climate change* in the survey results, and the least important trends are *technology driven approaches* and *economic instability*. The importance given to *climate change* concurs with the high number of projects that address this topic. *Social polarization* and *economic instability* are considered quite important, although there are very few projects dealing with these global trends. Annex 2 presents the complete analysis of projects (Fig. 40).

	1. CLIMATE CHANGE						2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS						4. GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES				
	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3.1	3.2	3.3	3.4	3.5	3.6	4.1	4.2	4.3	4.4	4.5	4.6	5.1	5.2	5.3	5.4	5.5	5.6	6.1	6.2	6.3	6.4	6.5
1. Neighborhood oasis	1																																			
2. Smarter together																																				
3. Energy saving license																																				
4. WALTER																																				
5. TRESDAY																																				
6. Optimal microclimate in Aspern																																				
7. Wien plotraum																																				
8. Thematic city map "Energy"																																				
9. Wiener safe																																				
10. Power-2-heat																																				
11. Blockchain in the energy sector																																				
12. CO2-integration center																																				
13. Aspern Smart City research																																				
14. Pocket Mannerhatten Ottakring																																				
15. Wiesel																																				
16. Smart Traffic lights																																				
17. Temporary offices buildings at Heidenplatz																																				
18. Lein																																				
19. Research projects unteres Hausfeld																																				
20. Vienna research festival																																				
21. Green Spaces in Vienna																																				
22. Future jobs																																				
23. Co-creation lab in Vienna																																				
24. thinkport Vienna																																				
25. Energy from metro brakes																																				
26. Smart City Wien framework strategy																																				
27. Smart Campus																																				
28. Smart Wien application																																				
29. no ho vienna																																				
30. Dual infiltration model																																				
31. Viennese campus model																																				
32. ViennaGreen CO2																																				
33. Digital city Wien																																				
34. Wien as public well																																				
35. hanging gardens of Oberes																																				
36. Vienna sewer Simmering																																				
37. Wind comfort optimization at the Vienna																																				
38. Digital Agency Vienna																																				
39. LED streetlights																																				
40. Egoenvironment																																				
41. H&M-re-USE Vienna																																				
42. Make your city smart																																				
43. Mischung possible																																				
44. Vienna's renewable heating programme																																				
45. Smart block step II Wien																																				
46. Smart City in number housing																																				

Figure 40: Image of the classification table for challenges of Vienna. See Annex 2 for more details. Source: Authors own elaboration.

6.1.4. Global vision and guidelines

Figure 41: Synthesis of the modifications made to the conceptual model in the analysis of implementation (before, 2016, and now 2018) and discourses. Values explained in sections 6.1.1., 6.1.2. and 6.1.3. Source: author's own elaboration.

Finally, the comparison in Fig. 41 allows guidelines to be drawn to improve the Vienna Smart City strategy. These guidelines aim to narrow the gap between the actual implementation of the Smart City and the visions of the different stakeholders, and to promote the inclusion of citizens and the political, social, economic and knowledge stakeholder groups.

- **Smart Cities are not predominantly understood as technology-driven entities in the stakeholders' discourses.** Half the stakeholders interviewed clearly express this vision, and only three mention ICT in their definitions. In the project analysis, although most of the projects use technology, only 16 use ICT (excluding those that publish information on a webpage). This trend is the third most important in the global trends addressed by the different projects. However, it is rated as one of the least important global trends. Technology, though important, does not play a key role in the Vienna Smart City, and this tendency should hence be maintained.
- **More balanced stakeholder involvement.** There is clear agreement on the key role of the public sector, and especially the municipality and local public companies in developing the initiative. However, the stakeholders' subsystems are fairly unbalanced, and the results of the initiative could be improved by increasing the collaboration between them. Only four definitions mentioned the citizen-centric vision. This appears to contradict the fact that social polarization and inclusion are among the key global trends and challenges for Vienna. To reduce the gap between the stakeholders' vision and implementation it is necessary to raise awareness among stakeholders of the need to involve civil society stakeholders.
- **Maintaining efforts and increasing strategies for social awareness in *environmental* projects.** There is also consensus as to the importance of "tackling *climate change*" as one of the main global trends affecting the city of Vienna, although with certain contradictions. When the challenges are assessed separately, *climate change* is not considered very important by the stakeholders, and the *environment* does not appear to play a key role in their view of the concept in their definitions of the Smart City. Although efforts in this direction should be continued, other aspects of the city were considered to have a higher priority. This suggests the possibility of increasing the awareness of specific challenges linked to *climate change*. *Mobility* projects usually include an *environmental* component, and this topic follows the same tendency as the *environment* dimension. There are therefore far more projects affecting this dimension than the number of times it is mentioned by stakeholders in their definitions. However, they consider challenges linked to *mobility* to be very important (4.5., 6.3), so these must still be addressed. *Mobility* projects should therefore also continue to be developed.

- **Increasing focus on governance.** The *governance* dimension is crucial in the discourses and is the third dimension in terms of number of projects dedicated to this aspect. However, there is still a large gap between the low number of projects addressing *governance* issues and the proliferation of projects on the *environment* dimension. A more balanced initiative could be achieved by increasing the number of projects on *governance*. The number of projects on *governance* challenges is quite low in any case. An increase in the focus on *governance* is therefore recommended.
- **Greater effort to promote social inclusion and foster human and social capital.** The *people* dimension is rated second in importance and is also second in terms of the number of initiatives on this subject. However, as in the case of *governance*, there is still a significant gap between the few projects on issues related to the *people* and the ones related to the *environment* dimension. *Social polarization* is the second trend according to the stakeholders surveyed, and the one with the most important challenges, and yet it is among the trends with the fewest projects addressing it. This contradiction must be resolved by increasing the number of projects to tackle social inclusion. There are very few projects aimed at fostering human and social capital despite its importance to stakeholders. Promoting human and social capital is therefore an essential element for achieving social inclusion.
- **Increasing efforts in the *economy* dimension by promoting social and human capital.** The economic dimension is relatively unimportant in terms of the number of projects addressing it and the visions of the stakeholders, and is clearly unbalanced in the system. The global trend of *economic instability* is the subject of fewest projects, as occurs with the challenges related to this trend. The trend is also considered among the least important by the stakeholders. However, this trend includes what the stakeholders consider to be one of the most significant challenges: “5.4. Fostering human and social capital as a source of innovation”. Efforts must therefore be increased to ensure a greater weight of the economic dimension in the system, and this can be achieved by fostering social and human capital.

In conclusion, the Vienna Smart City Strategy should place the focus on social and human capital to reduce social polarization. *Governance* must play a key role, promoting the inclusion of different stakeholders. The *environmental* and *mobility* dimensions show agreement between implementation and discourses, and should thus maintain their relevance. An improved balance in the system could be achieved by increasing efforts in the *economy* dimension by focusing on human and social capital.

6.2. The case of Milan

Milan Smart City initiative has been analyzed in two different moments of its development. Different stakeholders have been asked about their idea of the Smart city and results have been compared. The methodology explained in chapter 5 was applied following the guidelines of section 6.1.

Milan started its way to become a Smart City at the end of 2011 with the participation of the Municipality in the European calls, and from this point on the city has also participated in territorial projects and developed its own initiatives at local level.

At a European level, the city participated in the calls for the "Smart Cities and Communities" initiative. This initiative was promoted by the EU Commission, within the Europe 2020 Strategy. Its aim was to make European cities more efficient and sustainable from different points of view: energy, transport, information, communication technologies, economic development and social policies. At an international level Milan has become an active member of different Smart city networks, like Smart Cities Stakeholders Platform, C40 and Eurocities.

The local government has participated with the province in different calls and projects. Some of them were funded by the European Structural funds. At a local level Local government and the Milan Commerce Chamber have established a partnership for collaboration in research and social innovation, business and high financing.

In May 2013, the document of guidelines for Milan Smart city (Comune di Milano, 2013a) was published, providing a general idea of which are the main focuses of the initiative (Table 29). The structure is divided into seven areas. Six of them are coincident with the areas proposed by (Rudolf; Giffinger et al., 2007) plus a first one focused at internacionalization.

Milano Smart City guidelines	Area of focus
1. global city, national and european lab	Internacionalization
2. lab for sustainable urban mobility	Mobility
3. lab for environmental and energy policies	Environment
4. lab for social inclusion and diversity	People
5. lab of well-being in the city	Living
6. lab for decluttering and simplifying public administration	Governance
7. incubator for business models	Economy

Table 29: Milano Smart City guidelines. Source: author's own elaboration

All the efforts that Milano city had made to achieve a Smart City were summarized in the document “Milano Smart City. Progetti e principali interventi”, elaborated at the end of 2013 (Comune di Milano, 2013b). This document includes a list of all the projects that Milan was developing at the moment.

Graph 9: Share of projects developed by MIUR and POR financing and by Comune di Milano (divided into the different dimensions). Source: author’s own elaboration.

Around 20% of the projects were financed though MIUR (Ministero dell'Istruzione dell'Università e della Ricerca) and POR projects (POR FESR 2007-2013 (structural funds) (see graph 9 and Table 30). But the biggest share was financed by Comune di Milano. Projects were distributed among the areas as follows (Tables 31 and 32)

BANDO MIUR ““SMART CITIES AND SMART COMMUNITIES AND SOCIAL INNOVATION”	1	S[m2]ART
	2	URBe-LOG
	3	DECISION THEATRE
	4	PSC GIUSTIZIA
	5	SWaRM-Net
PROGETTI POR FESR 2007-2013 (FONDI STRUTTURALI).	6	SCUOLA -smart campus as urban open labs
	7	SPAC3
	8	SIMULATOR
	9	CITY-WISE-NET
	10	OPTI-LOG
	11	PROACTIVE
	12	E-WASTE
	13	ABILITY
	14	GIOCOSO

Table 30: Milan Smart City Projects financed by MIUR and POR in the document of 2013(Comune di Milano, 2013b). Source: Author’s own elaboration.

ELENCO "SMART" DELL'AMMINISTRAZIONE COMUNALE	PROGETTI Smart Mobility	15	Area C
		16	TIDE (transprot innovation deployment for europe)
		17	preferenza semaforica
		18	bike sharing BIKEMI
		19	ClinSC-City mobil 2
		20	Guidami
		21	Infopaline
		22	Portali della mobilita e infoalert
		23	Indirizzamento di parcheggi
		24	LINK-SE-Isole Digitali
		25	Converse
		26	ClinSC-PE-FR-Evue
		27	Aree carico scarico
		28	Merci pericolosi
		29	Infomobilita per la citta di milano
	Smart Economy	30	Ticketing payment
		31	Fare impresa
		32	Iride
		33	E015
	Smart Environment	34	ClinSC-smart spaces
		35	ClinSC-PE-EUGUGLE
		36	Cestino intelligente
		37	Smart IP
		38	DOMO GRID
	Smart Living	39	Piano di teleriscaldamento
		40	MET (museo esteso nel territorio)
		41	Musei.net
		42	MiTo
		43	Media Librari on line
		44	Servizi online
		45	DigitaMI
		46	App eventi
		47	App guida milano
	Smart People	48	Mobile QR code
		49	Portale turismo
		50	LIA (libro italiano accessibile)
		51	autoprestito RFID
		52	Real IT
		53	ClinSC-my neighbourhood my city
		54	Mappatura delle reti informali
		55	CROWDFUNDING
		56	Centro per le migrazioni
		57	Carta identità sociale
		58	Punt sociali
		59	Agenzia uni
		60	Ambrogio
		61	Multa semplice
		62	LINK-SE-WI-fi area
		63	Anziani piu coinvolti e piu sicuri

Table 31: Milan Smart City Projects financed by the local government (A) in the document of 2013(Comune di Milano, 2013b). **Source: Author's own elaboration.**

ELENCO "SMART" DELL'AMMINISTRAZIONE COMUNALE	Smart Governance	64	Smart ciber
		65	Messa in rete delle istituzioni del welfare
		66	Semplifica mi
		67	Caronte
		68	Icaro
		69	Geo school
		70	Piano dei tempi e degli orari
		71	Genitori i video
		72	PMUS
		73	PUGGS
		74	PGTe NIL
		75	Open data
		76	Nuovo portal insittuzionale
		77	MOC-main operation center

Table 32: Milan Smart City Projects financed by the local government (B, continuing table 19) POR in the document of 2013 (Comune di Milano, 2013b). Source: Author's own elaboration.

These projects and initiatives have been boosted by the EXPO 2015, an International exhibition that took place in Milan from the 1st of May to the 31st of October 2015 under the motto "Feeding the planet, energy for life". This event supposed a great impact in the city, attracting 22.200.000 visitors. Providing services to this number of visitors was a great challenge for the city and fostered Milan Smart City initiative development.

After EXPO2015, the initiative has changed its focus, even if apparently it maintained the guidelines proposed in 2014. The Milano Smart City webpage (Comune di Milano, n.d.) was studied to describe the new approach to the initiative. The structure of projects in the webpage is completely different to the document explained and the new focus to innovations in the area is clear. The webpage shows a structure that is much less transversal among areas than before. It is focused in areas like Incubator's networks, Innovation in Milan, Social innovation, Crowdfunding and Sharing economy, and a Milan-NYC business exchange. There is also a section for projects which only included 4 projects at the moment of consultation, and a section of MIUR and POR projects, which maintains the project referred in the summary of projects of 2013 (Comune di Milano, 2013b). In the general section, both the document of guidelines (Comune di Milano, 2013a) and the document of projects (Comune di Milano, 2013b) are included. See table 33.

SMART CITY	NETWORK INCUBATORI	DI	1	NETWORK DI INCUBATORI
	INCUBATORI		2	Polihub
			3	SpedMiUp
			4	Parco tecnologico Padano
			5	LEM*, Maker Space
			6	Arte e Messaggio
			7	Centro Quarenghi
			8	Incubatora d'azeglio (Also included in Sharing Economy)
			9	SMART CITY LAB
	Progetti MIUR E POR		10	S[m2]ART
			11	URBe-LOG
			12	DECISION THEATRE
			13	PSC GIUSTIZIA
			14	SWaRM-Net
			15	SCUOLA -smart campus as urban open labs
			16	SPAC3
			17	SIMULATOR
			18	CITY-WISE-NET
			19	OPTI-LOG
			20	PROACTIVE
			21	E-WASTE
			22	ABILITY
			23	GIOCOSO
MILANO IN			24	MILANO IN
INNOVAZIONE SOCIALE			25	FABRIQ
PROGETTI			26	Milan young Citizens
			27	BOOSTINNO
			28	Sharing cities
			29	Open Care
CROWDFUNDING			30	CROWDFUNDING
Sharing economy			31	SHARING ECONOMY PLAN
			32	COHUB
			33	SE-bando makerspaces-fablab-comune dimilano
			34	SE-bando coworking-camera di comercio
			35	SE-INC-Incubatora d'azeglio
			36	SE-bike sharing BIKEMI
			37	SE-Spazi inutilizzati
			38	SE-allogi ospedale solidale-camera di comercio
			39	SE-giardini condivisi
			40	SE-tira su la cler
NYC-Milan business exchange			41	NYC-Milan business exchange
Links			42	Isole Digitali (Also included in Sharting economy)
			43	link-SE-Open data (Also included in Sharting economy)
			44	LINK-SE-WI-fi area (Also included in Sharting economy)

Table 33: Milano Smart City projects according to the webpage as consulted in January 2017. Projects in grey colour are coincident with the previous stage of the initiative. Source: Author's own elaboration.

Milano Smart City was led by the Smart City Service, specifically created for this purpose inside the Economic Innovation, Smart City and University sector of the Labour, Economic development, University and Research Council (Servizio Smart City, Settore Innovazione Economica, Smart City e Università - Direzione Centrale Politiche per il Lavoro, Sviluppo Economico, Università e Ricerca). From the Summary of projects developed in 2013 (Comune di Milano, 2013b) it can be deduced that, even if the Economy council was leading the initiative, it aimed at being integrative among different departments. However, the evolution in time shows a new approach in which this integrative purpose is lost. The projects included in the initiative show an approach from the field of economy instead of a collaboration among departments. However, the initiative shows in this second stage the purpose of involving social and economic stakeholders through different calls focusing on incubators or sharing economy.

Therefore, this research is analyzing Milan Smart City initiative implementation through its focus before the EXPO, at the end of 2013, and after the EXPO2015, in February 2017. We will refer to these different moments as Implementation (before, in 2013) and Implementation (now, in 2017). Furthermore, a sample of experts have been interviewed as explained in the methodology. The three visions will be compared and conclusions will be extracted.

6.2.0. Interviews analysis: Smart City definitions

The strategy of Milan started in 2011, but was raised in 2014 under the Directorate of Urban Economics and Labor of the town hall, in cooperation with the Chamber of Commerce of Milan. At that time there was a powerful boost to the strategy, which had a multidisciplinary cut, thanks to the Expo Milan 2015. Later layers were added. The model has been used to explain how the initiative is currently presented and what projects are really under way, in a non-disruptive evolution (See Fig. 42). See Annex 3 for the complete details of the analysis.

Thus, the image that is offered with the 12 projects advertised on the web (1), is that most of the current initiatives are focused on the area of *economy*, followed by the area of *people*. *Governance* also plays an important role. *Environment* and *mobility* are clearly relegated to a secondary role with a single publicized project.

If we also consider the projects coordinated by the Smart City department (2), the focus is clearly on *people*, followed by *governance*, habitat and *economy*. A large number of projects affect the *environment*, while *mobility* and infrastructure is the least affected area.

However, if we go deeper into the Smart initiative investigating its ongoing projects since 2014 (110 projects) (3) we find that there are many more projects and that the focus of the initiative is different. The largest number of projects focused on *governance*, especially in improving the internal functioning of the municipality. *People* and *Habitat and services* are the second most

important groups. The other three groups have similar importance in the number of projects dedicated to them.

Figure 42: projects advertised on the Milan Smart City web (1), projects coordinated by the Milan Smart City department (2) and ongoing projects since 2014 (110 projects) (3).

		Government institutions	Universities and research centers	Companies	Civil society
Dimensions	<i>Governance</i>	(1) President of Participation popular initiatives and Open Data Commission	(6) Associate professor, Department of Architecture and Urban studies, Politecnico di Milano. Project coordinator Open4citizens.		
	<i>Economy</i>	(2) Project Manager, Department of Economic Innovation, Smart City and University			
	<i>Environment</i>			(10) Head of A2A Smart City lab	(13) President, Legambiente Lombardia
	<i>Mobility</i>	(3) Mobility Planning Area Director, Environment, Mobility and Territory Agency (AMAT)	(7) Director of Poliedra Research Group and Professor at the Department of Industrial Design, Arts, Communication and Fashion, Politecnico di Milano		
	<i>People</i>				(14) Coordinator FGB Learning, Fondazione Giacomo Brodolini, (15) Co-founder at WEMAKE
	<i>Living</i>			(11) Partner at AVANZI	
Transversal subsystems	Technology	(4) Chief Information officer		(12) Chief Executive Officer and Scientific Director of CEFRIEL and Vice President of CEFRIEL USA Inc	
	Planning	(5) Deputy Mayor Urban Planning, Green spaces and Agriculture	(8) Professor and Director of Architecture and Urban Studies Department; (9) Assistant professor in Urban design		

(1) Emilia Bossi; (2) Piero Pelizzaro; (3) Valentino Sevrino; (4) Guido Albertini; (5) Pierfrancesco Maran; (6) Grazia Conciglio; (7) Alberto Colomi; (8) Gabrielle Pasqui; (9) Eugenio Morello; (10) Pierpaolo Palazzoli; (11) Matteo Bartolomeo; (12) Alfonso Fugetta; (13) Damiano DiSimine; (14) Fabio Scaragli; (15) Costantino Buongiorno

Table 34: Selection of stakeholders in Milan, according to three criteria: they belong to different stakeholder groups; they specialize in different Smart City dimensions and in the transversal areas of technology and planning, and the number of Milan Smart City projects the stakeholders are participating in. Source: Author's own elaboration.

A total of 16 relevant agents (Table 34) were interviewed. They were asked about their vision of the Smart City and about which of their visions came closest to the models described. The result was a variety of opinions in which, although the majority chose transition model B (31.5%), models A and C were also selected to a large extent by agents (25% each). In the municipality, the agents selected the first model, except for the Smart City team member, who selected the second one for the current state although he declared the C model as the model to which they are directed. See annex 3 for detailed results of the interviews.

However, it was difficult for them to understand the differences between the models and the information they were trying to represent. For them, comparing three models was too complicated. For further research, there should be another way of extracting information and comparing it to clarify a) the extraction of information and b) the number of models that are being produced.

In the next step, the definitions provided by the different stakeholders (Tables 35 and 36) were analyzed:

Eugenio Morello-Polimi/sharing cities	A Smart City project should have clear actors and public administration: public authority should warrant quality and use of data (necessary for reaching the goals). Therefore the public authority should coordinate. It should also include the people, both private stakeholders and local stakeholders (societal, etc.). Inclusive: there should be a strong investment on communication to scales up the project and for results to reach people. 3. It should transform invisible actions into visible ones, we are (lacking?).
Grazia Conciglio-Polimi	I would say 3 characteristics: firstly: consistent with a sound urban scenario Secondly, problem driven. Thirdly: frugal.
Afonso Fugetta,Cefriel	Assumption: City is exchange of leverage information: infrastructure contribute to it: they enhance activity through technology. First level: Physical information. Connectivity: is a precondition. How to provide it? Otherwise it is isolated. Second level: ability to share and explicit info and digital assets of the city. There has to be interoperability and for this enablers. The third level would be the application to projects. As a summary. 1. Physical information, 2. digital, 3. application and services (the first 2 are enabling layers)
Valentino Sevino, AMAT	A Smart city is a city where we have the possibility to know all aspects about mobility. There are different mobility services: public transport, sharing mobility, electric, bike, scooter. Mobility systems don't speak with each other, they are no connected. Each mobility service is not connected, they must share data in a platform, to get the best service choice. Mobility as a service means one subscription to all mobility services: one flat fare in relation to your behavior, or the best fare, usually, 44 minutes. Mobility and citizen must be in the same platform,
Alberto Colorni,Poliedra	In each city it is different: Barcelona, economy, Amsterdam: city lung. Copenhagen: mobility, Vienna: Quality of life. A SCP needs to answer the big problems of cities: ageing population, global urbanization, migrants... Social innovation must be understood as a reward to positive behavior instead of a punishment. Sharing cities: has a rewarding scheme: digital social market, to obtain some benefits. Digital can allow tracking and social market allows rewarding at a community level. Technology to obtain new value regarding positive behavior. Digital: rules to be tracked. Social: valorice, obtaining positive evidence.
Piero Pelizzaro, Comune di Milano.	For example, a lamppost that retrofits 50% of the energy in a pear 2 pear payback. It is not smart, it improves efficiency. It must: 1. Technology: Look out of the known, upgrade the existing infrastructure, for example with sensors. 2. Market: Administration + new markets. 3. Working with local stakeholders. Improving social benefits: security; for the environment (better prediction). Social+market+technology. To overcome Silos.
Fabio Scaragli, Fondazione Giacomo Brodolini	Firstly, local administration and citizens participation combining top down plus bottom-up. Secondly, good technological foresight: local administration to be aware of advancements in technology. Thirdly, to integrate the 3 dimensions (social, environmental and economic) in an integrated plan. And finally, approaching smart city projects as an innovation before going full scale, developing pilots.

Table 35: Definitions provided by stakeholders interviewed in Milan (Continues in table 26:). Source: author's own elaboration.

Milly Moratti, Comune di Milano	It must be connected to an ecological vision. It must establish relationships with people. It must be inclusive: not to put away people depending on culture, age. It should foster quality of life. It should be accessible, nobody has to study for using it. 6. It must make things easier. It must build networks: if you have not your own farm: establishing nets of producers. Public administration should build community.
Costantino Buongiorno, Wemake	The use of technology as a tool, not as a goal, to try to make cities smarter. It must be transparent: not a black box: intelligence is not to be hidden. i.e. if there is a system that is able to understand pollution and trigger actions: this algorithm has to be transparent.
Matteo Bartolomeo, Avanzi	The idea of network. Firstly, to build a network among peers. Secondly, to build a multi-level network between people and organizations at different levels of society.
Gabrielle Pasqui, Polimi	1. A smart city project of a city of parts: promoted with citizens. 2. Integrated use of innovative technology to empower citizens, as its final goal. 3. The use of different technologies in an integrated way, starting from the context (specific problems).
Damiano di Simine, Legambiente Lombardia	It depends on the target. The important thing is speaking with people. Not the whole, to reach the champions, persons that drive the change in their communities. Persons/ institution / organizations. Active involvement of civil society in non-profit sector. Also informal aggregations. You cannot act just with commercial interest. It is just a tool. The words don't need to be smart, but words that everyone can understand.
Pierpaolo Palazzoli, a2a	A smart city projects must have sensors, and network and data and a use case, according to the priorities of cities, to solve their challenges. It must be aggregable, interoperability of utilities to get benefits for the citizen. A city has to start from what it has. It is key, the sensing and the real time data, otherwise there are difficulties of correlation,. It can be used for the prediction of elements, to give to all the possibility to predict the future, Form environment to mobility fluxes, to technology fluxes.
Guido Albertini, Comune di Milano	A SC is so if it becomes an easy-to-live city. The ones I referred first are the tools that must enable the citizen to move, to find information, to work more easily. Technology have to be used for this purpose, as the same technology can be the basis for making decisions on objective elements (the information mentioned earlier), data ... e.g. a zone is too loud, too polluted, too busy, based on this information the decision maker can rely on making targeted interventions. It already happens in Milan and in other cities (more or less aware). A remarkable increase in video surveillance tools allows you to have greater security on the one hand but also allow you to better control traffic in certain areas. Thus, I can divert traffic to a zone or because there is a problem or because there is too much traffic, I work in smart conditions, and this is already happening in Milan (a predictive approach to the traditional reactive approach). There is no a smart project, but a set of projects that make the city smart. Milan has been measured with smartness indices, but I do not refer to it as above mentioned to a specific project.
Pierfrancesco Maran, Comune di Milano	Transversal nature of the project is very important; on city management normally you look at the problems from individual points of view when it comes to traffic, the road sector is concerned with the issue; in the same way when it comes to environment. If we talk about home or public lighting, each sector has its own manager. The advantage of the Smart City is that all objects, all matters interact with each other and you can have some improvements on issues that, until a few years ago, there appeared to side with respect to the main theme. This seems like the predominant element and the more challenging because the technologies have changed but have not changed the people and the underlying mentality that drives these processes. The concept of Smart City emphasize the importance for Public Administrations, but it would just not this one. I reason of all public and private actors who insist on the city and see all the trouble of looking at the city from a different perspective.

Table 36: Definitions provided by stakeholders interviewed in Vienna (Continues table 35). Source: author's own elaboration.

When analyzing the definitions provided by the different interviewed experts, we find that they refer to the different dimensions, especially to *economy*, followed by *people*. Other interesting topic is the idea of improvement as a major goal of the Smart City (Graph 10).

Graph 10: Classification of terms included in Smart City definitions by interviewed stakeholders in Milan.
Source: Author's own elaboration.

Thus, the idea of improvement, mentioned as “better”, “enhance” “improve” etc. is present in several definitions as one of the main goals of the Smart City. Other objectives, like integration, citizen centric approaches, efficiency and quality of life are also quite important to interviewed experts.

For the experts interviewed in Milan, technology is mainly a tool to reach the described goals. They also mention technology in a wide sense, but they usually speak about the importance of communication and information. Data and big data are also present in their idea of Smart City.

Regarding the different dimensions, *economy* becomes the one that is the most mentioned by the different experts in their definitions. *People*, *governance* and *environment* are also quite present in their idea of what a Smart City is.

6.2.1. Subsystems and stakeholders in the Milan Smart City initiative

Figure 43: Conceptual model. Stakeholders involved according to the project analysis (implementation) before (2013) and now (2017), and the interview analysis (discourses). Source: Author's own elaboration.

Important differences appear when comparing the three models: stakeholders involved in the Milan Smart City initiative in two different moments (Implementation before and now) and the vision of the interviewed experts regarding the most important stakeholders of the initiative (Fig. 43). The complete list of stakeholders classified by project is included in Annex 3.

Stakeholders belonging to companies (economic stakeholders) are the main group in the projects of Milan Smart City initiative before and now, and their number is growing. Political stakeholders are the second group in number. Knowledge agents, and especially Political stakeholders, were represented in a higher number in the projects of Milan initiative before than now. However, the number of Social stakeholders involved in the Smart city initiative has increased. In the initiative now there is a more balanced presence of political, knowledge and social stakeholders.

The interviewed experts have mentioned in a higher number of political stakeholders, followed by civil society organizations and members. Companies are mentioned in a smaller number, and knowledge stakeholders are the group that is mentioned a smaller number of times.

Even if political stakeholders have decreased their protagonist role in the Smart City initiative and economic stakeholders have always being very present, the perception of interviewed experts is that political and social stakeholders are the most important groups. Knowledge stakeholders have reduced their number during the time and they are not perceived as key in the process.

6.2.2. Milan Smart City projects and dimensions

IMPLEMENTATION (BEFORE)

IMPLEMENTATION (NOW)

DISCOURSES

Figure 44: Conceptual model modified according to the number of projects in each dimension (implementation) before (2013) and now (2017) and the terms appearing in the Smart City definitions by different stakeholders (discourses). Source: Author's own elaboration.

In the evolution of the Smart City initiative, the focus of the projects has drastically changed (Fig. 44). See Annex 3 for details. Projects focused on *Governance* were the most important regarding the number in the Milan Smart city initiative before the EXPO. They were followed by *Living and services* and *people* initiatives. *Environment* and *mobility and infrastructures* played a less important role. Finally, very few projects were focused on the *economy* dimension.

Looking at the projects after the EXPO, *People* is the dimension on which the higher number of initiatives are focused. *Living and services*, *economy* and *governance* become the second in number of initiatives. The initiatives on *governance* have been reduced, while the initiatives focused on *economy* have increased their number. The initiatives focused on *mobility and infrastructures* have been drastically reduced.

When analyzing the definitions provided by the interviewed experts, we found out the *economy* was core in their views of the Smart city, together with *people*. *Governance* and *environment* also played an important role in their vision of the Smart City. *Living and services*, and especially *mobility*, were much less important for them.

Therefore, Milan Smart city initiative has evolved in a direction that is more coincident with the vision of the different interviewed stakeholders. The focus has been redirected to *People* as a base for a change in *economy*, which is the most important dimension to interviewed stakeholders. *Governance* has lost importance, as well as *mobility*, which fits with their vision. But *environment*, which has also lost a part of its weight, is for stakeholders more important and should be better balanced.

Not only has the number of initiatives affecting each dimension changed, but also their focus (Table 37, -fig. 45 and annex 3). Milan Smart City initiative before the EXPO had a strong focus in *governance*, but mainly on two topics: increasing the efficiency of municipal management, and increasing transparency in the provision of services and information. In 2017, the initiative changed its focus and *governance* is not the main dimension anymore, changing also the approach to the topic. Today, it is paying special attention to participation and community building, producing a switch from a top-down to a bottom-up *governance* model. The target on *economy* increased and focused to innovation, entrepreneurship and productivity. Projects focusing on *mobility* reduced their number. Before they focused on traffic management and clean and no-motorized options, but now only the second aspect partially remained. A smaller number of initiatives affect Smart *Environment*. Beforehand, it was focused on monitoring and energy efficiency, but the spotlight has changed to smart buildings and building renovation, especially due to the new hubs and incubators. Research keeps being one of the main focus of the *people* dimension, but now it goes together with creativity and education and digital training.

When it comes to Smart *living*, the number of projects affecting welfare and social inclusion and on technology accessibility has been increased, but the focus on culture and leisure, reduced.

		BEFORE	NOW			BEFORE	NOW
Smart Governance	SGo1. Participation	9	15	Smart Environment	SEn1. Network and environmental monitoring	10	6
	SGo2. Transparency and information accessibility	13	4		SEn2. Energy efficiency	10	6
	SGo3. Public and Social Services	12	7		SEn3. Urban planning and urban refurbishment	3	5
	SGo4. Multi-level governance	3	3		SEn4. Smart buildings and building renovation	1	14
	SGo5. Community building and urban life management	6	12		SEn5. Resources management	5	5
	SGo6. Efficiency in municipal management				SEn6. Environmental protection	5	4
Smart Economy	SEc1. Innovation	2	21	Smart People	SPe1. Awareness rising and behavioural change	7	4
	SEc2. Entrepreneurship	3	17		SPe2. education and digital training	13	20
	SEc3. Local & Global interconnectedness	2	5		SPe3. Research	22	21
	SEc4. Productivity	2	14		SPe4. Creativity	1	15
	SEc5. Flexibility and conciliation in labor market	2	1		SPe5. ICT - Enabled working	0	0
Smart Mobility	SMo1. Accessibility	2	0		SPe6. Inclusive society	9	11
	SMo2. Clean, non-motorised options	9	6	Smart Living	SLi1. Culture and leisure	16	2
	SMo3. Public Transport	6	2		SLi2. Healthcare	4	2
	SMo4. Multimodality	1	0		SLi3. Security	5	1
	SMo5. Logistics	7	2		SLi4. Technology accessibility	7	11
	SMo6. ICT Infrastructure	3	1		SLi5. Welfare & Social inclusion	13	17
	SMo7. Traffic management	9	0		SLi6. Public spaces management	4	3
					SLi7. Tourism	8	1

Table 37: Classification of Milan Smart City projects before (2013) and now (2017) by project actions following the methodology proposed by Fernandez-Anez et al. 2018. Source: author's own elaboration.

Figure 45: Image of the classification table for the project actions of Milan. See Annex 3 for more details. Source: Author's own elaboration

6.2.3. Global trends and urban challenges for Milan

Graph 11: Comparison of the number of projects addressing each challenge and trend (columns; left y-axis: number of projects addressing each challenge or global trend) in Milan Smart City strategy before (2013) and now (2017), and the results of the survey of their importance in the case of Milan (points; right y-axis: importance value provided by experts (1-5)). Source: author's own elaboration

The challenges that the initiative before the EXPO was addressing were mainly linked to the problems of *global urbanization*, by providing access to services (graph 11, Fig. 46 and annex 3). The second global trend in importance was the one of the *Technology driven approaches* to urban issues, mainly enhancing the adaptation of *governance* to new technologies. This group is followed, and tightly related, by the importance of new *governance* models, mainly focused on increasing the effectiveness of institutions. The Smart City initiative has maintained the focus in *global urbanization* and *technology driven approaches*. Addressing *social polarization* has become an important challenge, while incorporating new *governance* models becomes less important than *climate change*. *Economic instability* was not addressed by the initiative before but now it is starting to be an important challenge for the initiative. Interviewed stakeholders provide a similar degree of importance to the different global trends in their visions. The global trends of *global urbanization* and *technology driven approaches* are the less important from the point of view of stakeholders, and the more important ones for the initiative in the two analyzed stages. *Social polarization* and new *governance* models are more important to them according to the questionnaire. Annex 3 contains the details of this analysis.

Milan Challenges analysis (before)	1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS						4. GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES											
	1	1.1	1.2	1.3	1.4	1.5	1.6	2	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3	3.1	3.2	3.3	3.4	3.5	3.6	4	4.1	4.2	4.3	4.4	4.5	4.6	5	5.1	5.2	5.3	5.4	5.5	5.6	6	6.1	6.2	6.3	6.4	6.5		
1. CROWDFUNDING																																												
2. UNW-SE-core Digital																																												
3. link-SE-Open data																																												
4. UNW-SE-Wi-Fi areas																																												
5. SE-bike sharing BIKEM																																												
6. MIUR-URBES-LOG																																												
7. POR-OPT-LOG																																												
8. MIUR-GWARM-Met																																												
9. POR-SCUOLA - smart campus as urban open																																												
10. POR-CITY-WISE-NET																																												
11. POR-E-WASTE																																												
12. MIUR-OBSESSION THEATRE																																												
13. MIUR-PPC GIUSTIZIA																																												
14. POR-SPACS																																												
15. MIUR-SIMJART																																												
16. POR-ABUTY																																												

Figure 46: Image of the classification table for challenges of Milan. See Annex 3 for more details. Source: Authors own elaboration

6.2.4. Global vision and guidelines

New conclusions from the different stages and the point of view of stakeholders can be extracted when observing all the analyzed elements together.

Figure 47: Synthesis of the modifications made to the conceptual model in the analysis of implementation before(2013). Values explained in sections 6.2.1., 6.2.2. and 6.2.3. Source: author's own elaboration.

Political stakeholders are very important in the development of the Milan Smart City initiative, and *governance* projects were the most important in number (Fig. 47). However, they were not addressing the switch to new *governance* models, but mainly the increase of the efficiency in the local administration through the adaptation to technological innovations. Therefore, challenges addressing technological innovations have been faced through *Governance* projects, and not only by *mobility and infrastructures* initiatives. The provision of services, addressing problems derived from *global urbanization*, has been core in this phase of the Milan Smart City strategy. However this has been made without the participation of social actors and with the involvement of a high number of companies instead. Economic stakeholders have an important weight in the initiative, providing technological solutions to reach the objectives, but projects and challenges focused on *economy* were the less important group. *People* initiatives were the third in importance, even if there is a low involvement of social actors. *Environmental* challenges and projects play a small role in the initiative.

Figure 48: Synthesis of the modifications made to the conceptual model in the analysis of implementation now (2017). Values explained in sections 6.2.1., 6.2.2. and 6.2.3. Source: author's own elaboration.

Economic stakeholders are the most important ones with a big difference, and their number is increasing even more (fig.48). There is a better balance among the other stakeholders, since project' stakeholders focused on *economy* have also grown in number. This combination has led to an increase on the projects focused on *People*, followed by *living and services*. Projects focused on *economy* have reached in number the ones focused on *governance*, which were the most important ones in the strategy before. The main groups of challenges being addressed by the initiative now are the ones of *Global urbanization* and technological innovations. Technological innovations challenges are being addressed not only by the *mobility and infrastructures* projects, but especially by other types of projects linked to *economy* and *people*, like the ones linked to the sharing *economy* or the entrepreneurs' hubs. *Governance* has passed to have a secondary role, both in the number of projects and in the challenges addressed. *Climate change* and *environmental* issues maintain a low weight in the initiative.

Figure 49: Synthesis of the modifications made to the conceptual model in the analysis of discourses. Values explained in sections 6.2.1., 6.2.2. and 6.2.3. Source: author's own elaboration.

The Smart City is perceived by the interviewed stakeholders to be based on Political and social stakeholders (Fig. 49). It aims to address *Social polarization* and the *need of new governance models* as the most important challenges. However in their definition of the Smart City *economy* initiatives play a core role, even if followed by *People*, and *economic instability* is among the less important challenges for them. *Governance* is the third in importance in their definitions, having almost the same importance as *environment*. *Global urbanization* is the global trend that worries them less and *Living and services* is mentioned very few in their definitions.

The comparison of these three visions can be summarized in the Guidelines for the Milan Smart City strategy aiming to:

- See if the evolution of the Smart City strategy is closer to the vision of the interviewed stakeholders and, therefore, it can make it easier their involvement.
- Identify elements from both models (before and now) that can improve the strategy and make it closer to the stakeholder's vision.

We can say that, in general terms, the evolution of the Milan Smart City strategy is closer to the visions of the interviewed stakeholders than before. Therefore the guidelines extracted are:

- **Redistributing the weight of stakeholders.** It would be important to increase the involvement of political and social stakeholders. The main political stakeholders involved are the direction of economic policy and labor, so an opportunity to increase this group could be to include other political stakeholders. -There is a very big number of economic

stakeholders involved, however interviewed stakeholders are not aware of this. The number of companies could be reduced and the aware about their involvement increased in order to increase transparency. Knowledge stakeholders have been reduced and this fits with the vision of interviewed agents. Civil society stakeholders linked to *economy*?

- **Balance among dimensions.** However it is important to take into account that they evaluate all the global trends to be very important for the city, and the difference in the values given to the importance of the different challenges is not big (1 point average). This confronts their idea of the smart city as focused on *economy* and *people*. It could be interpreted other problems to be solved by other initiatives, and not the Smart City. If we want the Smart City to be taken into account by stakeholders in a holistic way, we would need to get a bigger balance among areas. A possibility could be to recover some initiatives of the strategy before the EXPO, which was more balanced (with the exception of *governance*, which was enhanced).
- **People as a basis to a change in the *economy* dimension.** The *people* dimension has evolved from being the third in importance to be the first. This is linked to the evolution of the *economy* dimension from being the last in importance to be the third (together with *governance*). *People* and *economy* projects are tightly interrelated: *People* projects are fostering digital education, research and creativity, while *economy* projects are based on innovation and entrepreneurship. This is connected to the vision of stakeholders, where *economy* and *people* are the most important dimensions, and this aspect of the strategy should be maintained.
- **Addressing *governance* challenges.** *Governance* challenges is the second group of challenges in importance according to stakeholders. In the Milan Smart city initiative before, the *governance* dimension gathered the higher number of projects. However, *governance* challenges were not being addressed in this proportion, reflecting the weight of e-*governance* and the introduction of technology. The amount of projects that address *governance* challenges has even been reduced in the strategy. The future development of Milan Smart City should focus on addressing this challenges.
- **Revising the vision of Smart City as an initiative providing services.** *Living and services* is the second dimension in importance in the Milan Smart City strategy before and now. But in the vision of the interviewed stakeholders it is among the less important dimensions. Even if services can be key to address challenges like the Global polarization ones, the importance and weight of the projects focused to this dimension should be revised.

- ***Climate change is still important: addressing the challenges.*** Among the last in importance in the initiative in both the visions of the initiative before and now, and *Environment* dimension is also the second last in importance in. However *climate change* is the third in importance in the stakeholders' vision. So the weight of *environmental* projects should be rebalanced, increasing the number of projects addressing *Climate change*.
- ***Mobility as a way of addressing climate change and increasing quality of life.*** The weight of *mobility* projects has been reduced in the initiative, from being the fourth to be the last in importance. This is coincident with the opinion for interviewed stakeholders. However, in line with the previous recommendation, the role of *mobility* in reducing *climate change* impacts in the city needs to be taken into account.
- ***Technology as a crosscutting element.*** The trend of technological innovation in urban issues has been the second in importance in the initiative both before and now. This is because technology is a crosscutting element among the dimensions of the Smart City and it was being addressed by different dimensions. Addressing these challenges is the fourth trend in importance according to the interviewed experts. Reducing its weight can only be done in a transversal way, reducing the role of technology in the different dimensions.

As a conclusion, Milan should rebalance both the importance of the different stakeholders and the weight of the dimensions of the Smart City. Regarding the stakeholders groups involved in the initiative is key, giving back the main role to political stakeholders without forgetting social agents. *People* and *economy* needs to keep on being key in an interrelated way. The provision of services may not be so key. However, *environment* and *mobility* dimensions need to regain weight and keep on being connected with the other dimensions. Technology should be understood as crosscutting element among all dimensions, reducing its weight and becoming a tool that underlies the strategy.

6.3. The case of Barcelona

From 2011, the Smart City became a key element in the strategy of the city of Barcelona. The initiative of Barcelona Smart City focuses on using new technologies to connect people, information and urban elements with three main objectives: sustainability, quality of life and a competitive economy based on innovation (Bakıcı et al., 2013). The conceptualization of the Barcelona Smart City is quite complex, as explained in chapter 3. Figure 50 shows the relation among the structure of the Smart City and the impacts that served as a basis for the structure of projects implementation.

Figure 50: Conceptual model of the Barcelona Smart City relating the structure and the functions. Source: (Ajuntament de Barcelona, 2013)

The information of the Barcelona Smart City website (Ajuntament de Barcelona, n.d.) was gathered in 2016, before its disappearance. The structure of the initiative and a general description of 77 projects were obtained. By this moment, the structure of the initiative was very complex (see tables 38 and 39). Projects were distributed in 10 different areas: Public and Social services, Environment, Mobility, Companies and businesses, Research and Innovation, Communications, Infrastructures, Tourism, Citizen Cooperation and International projects. Most of the areas were sub-divided in new levels. Each of the mentioned axes included from 3 to 10 projects.

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

Public and social services	Open Government:	1	> eAdministration
		2	> Virtual Citizen's Advice Office
		3	> Portal for Procedures
		4	> Open Data BCN
		5	> Cloud BCN – Multi-council Open Data
	Health and Social Services:	6	> Telecare
		7	> Radar
		8	> BCN links
	Education and culture:	9	> mSchools
		10	> Smart Vegetable Garden
		11	> Infantium
		12	> The city I want to live in
		13	> Libraries
		14	> Culture notebook
	Barcelona in your pocket	15	> mobileID
Environment	Smart rubbish collection:	16	> Organic Waste Recycling
		17	> Green points
	Smart Mobility	18	> LIVE Electric Vehicle
	Smart Water	19	> Telecontrolled watering
		20	> Telecontrolled ornamental fountains
	Energy self-sufficiency	21	> Smart Grid
		22	> Hot and Cold Network
	Urban transformation	23	> Empty spaces (Pla buits)
		24	> Superblocks
	Resilience	25	> Board of Public Services and Infrastructures
Mobility	Smart Mobility	26	> Bicing
		27	> New Bus Network
		28	> School pathways
		29	> Smart traffic lights
		30	> Smart Parking
		31	> Micro-platforms for goods deliveries
	Barcelona in your pocket	32	> ApparkB
		33	> App&Town
Companies and business	Smart innovation	34	> Barcelona Growth
		35	> Smart City Campus
		36	> Bit Habitat
		37	<u>barcelona startups map</u>
		38	> Spark Lab
Research and Innovation	Urban transformation	39	> CityOS
		40	> Sentilo
		42	> Shared innovation centres

Table 38: Barcelona Smart City initiative structure and projects (continues in table 29). Source: Author's own elaboration from Ajuntament de Barcelona (n.d.)

Communications	Telecommunications networks	44	> New Telecommunications Network
		45	> Antenna Plan
		46	> Barcelona WIFI
	Barcelona in your pocket	47	> Contactless Barcelona
		48	> Apps4BCN
Infrastructures		49	> Mobile Services
	Smart lighting	50	> Lighting master plan
	Smart Urban Mobility	51	> Smartquesina
	Telecommunications network	52	> Deployment of Smart Infrastructures in Public Areas
	Infrastructure and logistics	53	> Industrial Ring
Tourism	Urban transformation	54	> Public Works Information Service
	Smart tourist destination	55	> New Tourist Products
		56	> Signposting
		57	> Bus Area
		58	> Geographic Integration System (GIS)
		59	> Touch Screens
Citizen cooperation	Citizen participation	60	> Open Government
		61	> Citizen Sensors
		62	> Manufacturing centres
		63	> More Sustainable Barcelona Map
		64	> Agenda 21 and Citizen Commitment
		65	> Citizens' Letter Box
		66	> BCN Open Government (App and Website)
		67	> Social-inclusion Apps
International projects		68	> City Protocol
		69	> BESOS
		70	> EUNOIA
		71	> CitySDK
		72	> Commons4EU
		73	> DC4Cities
		74	> INSIGHT
		75	> iCity
		76	> Open-DAI
		77	> CloudOpting

Table 39: Barcelona Smart City initiative structure and projects (continues in table 29). Source: Author's own elaboration from Ajuntament de Barcelona (n.d.)

In 2015, after the municipal elections, there was a change in the strategy that materialized in the Digital City initiative, coordinated by the technology commission. This new digital agenda commits at “putting people’s need at the center” (Ajuntament de Barcelona, 2017). The pla “Barcelona Ciutat Digital” aims at “going beyond the Smart City: for an open, equitable, circular and democratic city” (Ajuntament de Barcelona, 2016). The new digital city initiative is structured in three axes corresponding with the three main objectives of the initiative: Digital Transformation, Digital innovation and Digital Empowerment. Each of the axes is divided into 3 areas and each area include between 2 and 7 projects, reaching a total number of 38 projects (See table 40).

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

Axe	Area	Project
Digital transformation	Technology for a better government	1 Open budget
		2 Digital Market
		3 Ethical mailbox
		4 Digital identity
		5 Municipal apps
		6 Open software
		7 Transformation with agile methodology
	Urban technology	8 Internet 4 all
		9 Bicing
		10 Superblock
		11 T-mobilitat
		12 Sentilo
	City data commons	13 Open data challenge
		14 City Data analytics office
		15 Municipal control panel
		16 Open Data portal (Open Data BCN)
		17 DECODE
		18 CityOS
		19 Big Data for Public Policies
Digital innovation	Digital economy	20 Technology and innovation incubator
		21 Digital Social Innovation Programme (DSI4BCN)
		22 Digital Technology entrepreneurship
	Make in BCN	23 BCN Industry 4.0 Hub
		24 Fab Labs in the Technology Park
		25 Maker Faire Barcelona
		26 Making the neighbourhood: maker district
	Urban i-lab	27 Innovative public procurement
		28 Technology and innovation events
		29 Challenges and rewards
		30 Ecosystem of innovation
Digital empowerment	Digital education and training	31 Educational events
		32 Cibernàrium
		33 Fab labs (ateneus de fabricacion)
	Digital inclusion	34 Vincles
		35 Digital education and digital social inclusion
		36 Digital commons for social inclusion
		37 Declaration of Barcelona for digital social inclusion
	Democracy and digital rights	38 Decidim barcelona
		39 Technology and gender

Table 40: Barcelona Digital City strategy structure and projects. Projects that were also included in the Barcelona Smart City strategy in grey colour. Source: Author's own elaboration from Ajuntament de Barcelona (2017).

When looking at the governance models of the two initiatives, important differences appear. In the first stage, the Smart City initiative had a strong focus on planning, ICT and environment.

For the development of this initiative, the departments of infrastructure, urban planning, housing, *environment* and ICT were merged in the Department of Urban Habitat (March & Ribera-Fumaz, 2016; Tomàs & Cegarra, 2016). Now, the Digital City initiative is coordinated by the Technology commission. This commission works transversally among the municipal departments and tries to coordinate the efforts introducing a new approach to technology.

6.3.0. Interviews analysis

A set of interviews to 15 experts was developed facing stakeholders to the two different views of Barcelona. Details are included in annex 3.

The result of the analysis of the Smart City strategy, through the analysis of Smart City projects, is reflected in A (Fig. 51). The projects on the website are analyzed in 2016, analyzing a total of 77 projects. In the Barcelona Smart City model, we observed an initiative clearly oriented towards improvement in the field of *governance*. In the analysis in detail we see that special emphasis is placed on improving the efficiency of municipal services. The other areas present a balanced profile, including all of them a similar number of initiatives.

The new digital city initiative and its 38 projects exposed on the page at its launch in June 2017 are analyzed (Fig. 51). This strategy focuses on *governance* projects, and within it on issues of citizen participation. In the rest of the fields we observe a great emphasis in the areas of *people* and *economy* under the idea of collaborative *economy*. The areas that have been excluded from the digital city initiative are *mobility* and the *environment*, since the city council initiatives in these areas are not included in the initiative.

Figure 51: projects of the Barcelona Smart City strategy (A) and Barcelona Digital strategy (B) as presented to stakeholders in the interview.

This model was easy to understand by the different interviewed experts. The comparison of two diagrams representing two different moments was clear enough, and they used it to extract conclusions about the evolution of the initiative reflected in the model and their perception of it. Therefore, this will be the strategy used for comparison in the next chapters.

When the agents (Table 41) were asked about the adequacy of the models (Fig. 51) to their idea of Barcelona as an intelligent city, the majority (57%) chose A. Most of the *people* interviewed who did not belong to the city council chose A (72%) while all the agents who work for the town hall have chosen B.

		Government institutions	Universities and research centers	Companies	Civil society
Dimensions	<i>Governance</i>	(1) Commissioner of Participation and Active Democracy of Barcelona City Hall			(12) President of Poblenou Neighborhood association
	<i>Economy</i>		(4) Associate professor, Department of Operations, Innovation and Data Sciences, ESADE	(9) Founder and CEO, Anteverti, organizers of Smart City Expo World Congress	
	<i>Environment</i>		(5) Director of Fab Lab Barcelona and Fab Lab Academy global coordinator		
	<i>Mobility</i>		(6) Associate professor at Department of Microelectronics and electronic systems, UAB. Mass factory co-director	(10) Chief Operations Officer at Sensefields	
	<i>People</i>				(13) Manager of Ateneu de Fabricació Les Corts
	<i>Living</i>				(14) Innovation Director SUARA cooperative of social services
Transversal subsystems	Technology	(2) Chief Technology and Digital Innovation Office		(11) Customer Solutions Architect, CISCO	(15) Smart Cities Innovation Business Unit Manager at i2CAT
	Planning	(3) Deputy mayor on Ecology, Urban Planning and mobility, team	(7) Professor and Director of Centre of Land Policy and appraisals and (8) associate professor. Directors of the postgraduate program Smart cities: Urban planning, technology and sustainability. UPC		

(1) Fernando Pindado; (2) Francesca Bria; (3) Equipo de Janet Sanz; (4) Esteve Almirall; (5) Tomás Díez ; (6) Jordi Roig de Zárate; (7) Josep Roca; (8) Blanca Arellano; (9) Pilar Conesa; (10) Juan Campos; (11) Carles Batalla; (12) Salvador Clarós; (13) Jorgina Martínez; (14) Jordi Picas Vila; (15) Rosa Paradell

Table 41: Selection of stakeholders in Barcelona, according to three criteria: they belong to different stakeholder groups; they specialize in different Smart City dimensions and in the transversal areas of technology and planning, and the number of Barcelona Smart City and/or Barcelona Digital City projects the stakeholders are participating in. Source: Author's own elaboration.

Annex 4 includes the details of the interviews. The definitions provided by the interviewed stakeholders are provided in Tables 42 and 43. Interviewed stakeholders mainly use terms related to the dimensions of the Smart City when defining it (Graph 12). *Governance* is the most important group of terms in the stakeholders' definitions, followed by terms linked to *environment* and *living*. Technology and the idea of improvement are also core ideas in their views.

Francesca Comisionada Tecnología, Ayuntamiento Barcelona	Bria- de de	A smart city is a word that is not useful to know what is happening. Building a Smart City means technology and data to help people. Instead of focusing on a technology, think that they need, what problems people have. To complete this paradigm, come from people to solve problems like affordable housing, energy transition policy, renewable energy, opening public processes, as the superblock, managing mobility in the city: more space for pedestrians, increase participatory technology. How can we use technology to help to reach what governance and what technology. Problems of the Smart City: to be pushed by vendors, pushing smart solutions to cities, privatized solutions. There are interoperability problems. Cities were being sold and they do not know what. There is also a lack of communication among cities. -there is a lack of technology and data sovereignty. It is necessary to use technology and data to help people. There is a question of economic models and of city companies. Economic models: solidarity, cooperation, take back the energy network. The traditional Smart City agenda is against remunicipalization. It must be aligned with the overall political agenda.
Janet Sanz, Dirección del Área de Ecología, Urbanismo y Movilidad Ayuntamiento Barcelona	- de	Las Smart Cities son ecosistemas urbanos dinámicos y complejos con gente, flujos de energía, servicios (y financiación) que catalizan el desarrollo económico sostenible y una gran calidad de vida a través de un uso responsable de la tecnología y una planificación urbana transparente e innovadora que está estrechamente relacionada con la actividad social y económica y las necesidades de las comunidades. Más allá de ser una smart city Barcelona aspira a convertirse en una ciudad abierta, equitativa, circular y democrática, un referente en política tecnológica para un claro liderazgo público y ciudadano.
Fernando Pindado, - Area de Participación- Ayuntamiento Barcelona	-	Es una ciudad muy conectada: aparcamiento, equipamiento, trámites electrónicos. Me preocupaba que solo se aplicara a los servicios, al ciudadano como usuario. Pero la entiende como el concepto de Smart Citizens: capacidad de la gente para ser más que usuarios, para tener un papel protagónico. El programa de actuación se realiza a través de una plataforma digital para gastar menos agua, administrar tráfico, etc. Co-gestar servicios y mejora la relación del ciudadano con el funcionamiento de los servicios (por ejemplo, incidencias) sino también en la definición de políticas. Es utilizar la tecnología como herramienta.
Pilar Anteverti	Conesa,	Smart City: no es sólo tecnología, va más allá. Estrategia integral de la ciudad, de cómo utiliza no solo la tecnología, la innovación para hacer una ciudad más sustentable, inclusiva, equitativa. Más allá de digital. Ej. Los espacios verdes son Smart City pero no digital. Transversalidad. Rompe con las ciudades. Sostenible.
Carles Batalla, CISCO		Es una ciudad que tiene dos vertientes: la ciudadana y l vertiente tecnológica, que solo vale si tiene un beneficio en la ciudadanía. La tecnología sirve para mejorar la operación y el ciudadano no lo recibe directamente y no lo ve. Gestión del gobierno local produce un beneficio indirecto. Tener una visión de lo que está pasando por parte de quién lleva la ciudad. Sensorización, comunicación para los servicios (i.e. Parking. Deberían producir más información, por ejemplo regalar una placa de arduino. Sensorización por verticales (ie. basuras) no tienen por qué ser sofisticadas. Ej. contenedores con control por aplicación en camiones de basuras. La optimización es importante per es dudoso el retorno de la inversión en algunos casos. Las Smart Cities tienen que ver con la imaginación, muy eficiente, me permiten planificar. Smart Cities son sistemas inteligentes eficientes tecnológica y económicamente, no sensores a tuti plen sino optimización de los recursos.
Juan Sensefields	Campos,	La Smart City es la ciudad que debe prestar sus servicios de manera eficiente a los ciudadanos, que son el usuario final. Debe tener en cuenta temas de movilidad, discapacidad, ambiente...todos los medios tecnológicos que tenemos: para el ciudadano. Gestionar los recursos de manera eficiente para que los ciudadanos disfruten. Que tenga un fin, de manera eficiente, que se ofrezcan servicios a los usuarios, los ciudadanos.

Table 42: Definitions provided by stakeholders interviewed in Barcelona (Continues in table 43). Source: author's own elaboration.

Josep Roca y Blanca Arellano, directores postgrado Smart Cities UPC	Blanca: Término asociado a las tecnologías. La inteligencia ha estado siempre, y consiste en sumar a lo que entendíamos como actividades lógicas: habitar, trabajar, recrearse- Es una evolución de sostenibilidad + tecnología, no sólo tecnología. Josep: la tecnología no es siempre inteligente, y puede haber inteligencia sin gran tecnología. Es el elemento diferencia: tecnología para la gente. En Barcelona es sostenibilidad, movilidad, participación,...no es tecnología por tecnología, sino para la calidad de vida.
Esteve Almirall, ESADE	Depends on the city. A city covers many areas. Management of common goods, etc. In western countries it also means participation and democracy, innovative areas and everything around mankind. Management through new technology, making sure that everybody has access to it.
Jordi Roig de Zárata, Departamento de Microelectrónica y Sistemas Electrónicos. UAB/mass factory app&town	Ciudad donde aparece toda la tecnología que puede ayudar al ciudadano y a organizar la ciudad. El concepto es ambiente inteligente. La smart city tiene que ser una ciudad con ambiente inteligente Es poner sensores por toda la ciudad, se recaba información, es información se procesa y llega a los ciudadanos y administración. Si en una calle hay poca circulación y en otra mucha, redistribuir el tráfico. Eso es un ambiente inteligente
Tomas Diez, director of Fab Lab Barcelona	Branding ciudades- idea. Corporaciones (CISCO, IBM). Ciudad llena de ciudadanos inteligentes. Paradigma: no corporativo, no gobierno central a través de un conocimiento abierto, Disrupción completa de como producimos. El capitalismo digital es transitorio, se va a distribuir todo (mass distribution of everything).
Jordi Picas, SUARA	Conexión de todo para facilitar la vida de las personas en la ciudad. IoT y Big Data ayuda la vida de las personas en relación a las cosas. Importancia de los temas de predicción, ej. Esperar el bus, uso del transporte, de bicicleta y taxi y taxi privado, etc. para hacer más sostenible la ciudad. Ayudar a lograr los retos.
Salvador Clarós, Asociación de vecinos Poblenou	El concepto smart city ha tenido cierto bombo, se ha puesto de moda. genera recelo. Yo hablo de tecnologías urbanas, me gusta más este concepto que el de smart city. Tecnologías de la digitalización que implican las redes, la electrónica (sensores, cámaras) elementos que necesita el mundo digital para analizar el mundo analógico y codificarlo. Codificar las propiedades físicas del entorno. (no solo TIC) aplicadas a la movilidad, gestión urbana, instalación, agua gas, electricidad, contadores digitales, aplicación para gestionar el aparcamiento, etc. También el mundo de los servicios sociales (medicina, teleasistencia, educación, escuelas). Que la ciudad le provea de recursos de conectividad, que los programas de educación puedan acceder a ellos. Dos caras: la gente quiere WIFI pero se queja de antenas), Modelos de baja densidad, ciudad mezclada con actividad económica, superille, nueva red de autobuses, etc. el 22@ es un cluster TIC, energía, médico y de cultura.
Jorgina Martinez, Ateneus de Fabricacio	Participación ciudadana que nos va a permitir repartir: a) procesos, b) mentalidad, c) manera de fabricar, d) como tratamos incluso a las personas. Es un proyecto de valores. Es una herramienta más, la máquina, la participación y las sinergias.
Rosa Paradell, Fundacio i2cat	La smart city utiliza herramientas TICS para lograr la eficiencia y la sostenibilidad mejorar la calidad de la ciudad.

Table 43: Definitions provided by stakeholders interviewed in Vienna (Continues table 42). Source: author's own elaboration.

When it comes to the goals that the smart city pursues, improvement is the main objective of the Smart City, according to the interviewed stakeholders. Getting a citizen centric or citizen focused initiative is key for them. Sustainability and efficiency are more important in their definitions than quality of life. Implementing a holistic approach or the Smart City as a tool for management are also present in the analyzed definitions.

Graph 12: Classification of terms included in Smart City definitions by interviewed stakeholders in Barcelona. Source: Author's own elaboration.

Technology in a wide sense is present in all the analyzed definitions. In most of the case technology is understood as a tool. The idea of the opposition of the digital and the physical world is also present in their idea of the Smart City. More specific technological solution, as ICT, big data, IoT, etc., are not so relevant in their visions.

Governance is the most presented dimension in the analyze definitions. Terms related to it are mentioned 40 times. The second dimension in importance is *environment*, followed by *living* and *economy*.

6.3.1. Subsystems and stakeholders in Barcelona Smart City and Digital City initiatives

In the basis of the Barcelona Smart City initiative, the most important group of stakeholders are political stakeholders, closely followed by economic stakeholders (Fig. 52). The structure in the Barcelona Digital strategy is very similar, even if political stakeholders have won presence and the other stakeholders' groups are slightly more balanced. Even if they mention the involvement of citizenship in their webpage, in many cases it is not very clear which organizations or society members exactly they will include. The perception of interviewed stakeholders gives more presence to the political stakeholders, while the other groups are even more balanced. The strategy Barcelona digital is therefore getting closer to the vision of the stakeholders. Annex 4 explains the details of the analysis.

Figure 52: Conceptual model. Stakeholders involved according to the project analysis (implementation) of Smart City (2015) and Digital City (2017) strategies, and the interview analysis (discourses). Source: Author's own elaboration.

6.3.2. Barcelona Smart City and Digital city projects and dimensions

Governance is core in all the diagrams referring to the dimensions of the Smart city (Figure 53). Apart from the important weight of *governance* projects, the Barcelona Smart city strategy had reached a balance among the other dimensions (*economy, environment, mobility, people and living*). The Barcelona Digital strategy maintains the focus on *governance*, but *People* and *Economy* initiatives gain importance, while *mobility*, and specially *environment* projects are drastically reduced. The vision of stakeholders is closer to the Barcelona Smart City strategy, with a core role of *governance* and a balance among the other dimensions. Annex 4 includes the details for the analysis.

		SMART CITY	DIGITAL CITY			SMART CITY	DIGITAL CITY
Smart Governance	SGo1. Participation	15	10	Smart Environment	SEn1. Network and environmental monitoring	8	1
	SGo2. Transparency and information accessibility	20	16		SEn2. Energy efficiency	12	0
	SGo3. Public and Social Services	16	9		SEn3. Urban planning and urban refurbishment	8	2
	SGo4. Multi-level governance	6	4		SEn4. Smart buildings and building renovation	1	0
	SGo5. Community building and urban life management	15	16		SEn5. Resources management	8	0
	SGo6. Efficiency in municipal management				SEn6. Environmental protection	5	0
Smart Economy		19	14	Smart People	SPe1. Awareness rising and behavioral change	7	15
	SEc1. Innovation	15	17		SPe2. education and digital training	11	14
	SEc2. Entrepreneurship	5	14		SPe3. Research	12	2
	SEc3. Local & Global interconnectedness	19	14		SPe4. Creativity	3	9
	SEc4. Productivity	1	2		SPe5. ICT - Enabled working	1	2
	SEc5. Flexibility and conciliation in labor market	0	2		SPe6. Inclusive society	12	11
Smart Mobility	SMo1. Accessibility	7	0	Smart Living	SLi1. Culture and leisure	7	5
	SMo2. Clean, non-motorised options	5	2		SLi2. Healthcare	4	1
	SMo3. Public Transport	5	3		SLi3. Security	1	1
	SMo4. Multimodality	2	0		SLi4. Technology accessibility	13	12
	SMo5. Logistics	2	0		SLi5. Welfare & Social inclusion	6	13
	SMo6. ICT Infrastructure	11	4		SLi6. Public spaces management	3	2
	SMo7. Traffic management	7	1		SLi7. Tourism	6	2

Table 44: Classification of projects of the Barcelona Smart City and Digital city strategies by project actions following the methodology proposed by Fernandez-Anez et al. 2018. Source: author's own elaboration.

When looking at the number of projects it is important to take into account that total number of projects has been reduced from 77 to 39 (Table 44). The proportion of projects focused in participation, transparency and efficiency has been maintained in a similar way in the Barcelona Digital strategy. Community building has gained some weight. Regarding *economy*, Barcelona Smart City had a strong focus in innovation and local and global interconnectedness, mainly because of its participation in multiple European projects. This focus has been maintained, also focusing on entrepreneurship, and including projects focused on conciliation in the labor market.

IMPLEMENTATION SMART CITY

IMPLEMENTATION DIGITAL CITY

DISCOURSES

Figure 53: Conceptual model modified according to the number of projects in each dimension (implementation) of the Smart (2015) and Digital city (2017) strategies and the terms appearing in the Smart City definitions by different stakeholders (discourses). Source: Author's own elaboration.

Projects focused on *mobility* have been reduced, and only some projects focused on clean and non-motorized options, public transport and ICT infrastructure, and one project on Traffic management, are included in the Digital city strategy. But the dimension that has been drastically reduced is Smart *Environment*, only maintaining a couple of projects on urban planning and refurbishment and one addressing monitoring. It is important to highlight that many of the projects included in this dimension in the Smart City strategy are still ongoing, but are not include in the Barcelona Digital strategy. *People* has been the dimension that has presented the most important growth and has also change the approach. The strategy keeps a focus on education but combined with awareness rising and creativity, instead of with research. Inclusion slightly gains relative importance. In the Smart *living* dimension, the focus on technology accessibility and on culture and leisure is maintained, while the number of projects focused on welfare and social inclusion is duplicated (Fig.45, for more details see annex 4).

Barcelona Smart City projects analysis

PROJECT ACTIONS	DIMENSIONS									
	Smart Governance		Smart Economy		Smart Mobility		Smart Environment		Smart People	
	Smart Governance	Smart Economy	Smart Mobility	Smart Environment	Smart People	Smart Living	Smart Governance	Smart Economy	Smart Mobility	Smart Environment
PROJECT ACTIONS	Smart Governance	Smart Economy	Smart Mobility	Smart Environment	Smart People	Smart Living	Smart Governance	Smart Economy	Smart Mobility	Smart Environment
1. Administration										
2. Citizen's Office										
3. Digital for Barcelona										
4. Open Data BCN										
5. Open Data BCN										
6. Open Data BCN										
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Figure 54: Image of the classification table for the project actions of Barcelona. See Annex 5 for more details. Source: Author's own elaboration

6.3.3. Global trends and urban challenges for Barcelona

Graph 13: Comparison of the number of projects addressing each challenge and trend (columns; left y-axis: number of projects addressing each challenge or global trend) in Barcelona Smart City and Digital city strategies and the results of the survey of their importance in the case of Milan (points; right y-axis: importance value provided by experts (1-5)). Source: author's own elaboration

Both the Barcelona Smart City and the Barcelona Digital city strategy were addressing the impacts of technological innovation in urban issues (Graph 13). In the Smart city strategy, facing the *global urbanization* challenges was also key, while this group of challenges has diminished its importance in the Barcelona Digital strategy. The number of projects addressing the *need of new governance models* has increased, while the ones dressing *climate change* have almost disappeared.

Both models, but specially the Barcelona Digital strategy, contrasts with a more balanced vision of the stakeholders, in which the impacts of technological innovations are the fourth in importance. The *need of new governance models* is the most important group of challenges according to them, and more in consonance with the Barcelona Digital city strategy. *Climate change* overcomes in importance the vision of the two proposals, according to their opinions.

Climate change challenges were mostly addressed by the Barcelona Smart city Strategy, with a special focus on *increasing the efficiency in resources management*. *Social polarization* is was addressed in a similar pattern by both strategies, concentrating efforts in fostering social inclusion and in adapting the city to ageing and young population. The Barcelona digital strategy addresses also the problems of spatial inclusion. *Governance* challenges were also addressed in a similar way, even if the Barcelona Digital strategy pays more attention to the shift to a more participative and inclusive democracy, as well as to fostering citizenship co-creation and co-management. Regarding the challenges that *global urbanization* poses, the Smart city projects had a stronger focus on them, especially on the provision of services to a growing population.

Economic instability has been addressed by a bigger number of projects of the Barcelona Digital strategy. They are directed to the adaptation to changes in global economies and to fostering human and social capital as a source of innovation, while the Smart City strategy was focused

on employment creation. Both initiatives focus on the adaptation of *governance* and society to the technological challenges, but the digital strategy also focuses on innovations riven by human and social capital and on reducing the externalities. See annex 4 for more details of the analysis (Fig.55) .

Barcelona Digital City Challenges analysis		1. CLIMATE CHANGE					2. SOCIAL POLARIZATION					3. NEED FOR NEW GOVERNANCE MODELS					4. GLOBAL URBANIZATION					5. ECONOMIC INSTABILITY					6. TECHNOLOGY DRIVEN APPROACHES TO URBAN																	
		1	1.1	1.2	1.3	1.4	1.5	1.6	2	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3	3.1	3.2	3.3	3.4	3.5	3.6	4	4.1	4.2	4.3	4.4	4.5	4.6	5	5.1	5.2	5.3	5.4	5.5	5.6	6	6.1	6.2	6.3	6.4	6.5	
Project																																												
1 Open budget																																												
2 Digital Market																																												
3 Ethical mailbox																																												
4 Digital identity																																												
5 Municipal apps																																												
6 Open software																																												
7 Transformation with agile methodology																																												
8 Internet 4 all																																												
9 Bicing																																												
10 Superblock																																												
11 T-mobilitat																																												
12 Sentilo																																												
13 Open data challenge																																												
14 City Data analytics office																																												
15 Municipal control panel																																												
16 Open Data portal (Open Data BCN)																																												
17 DECODE																																												
18 CityOS																																												
19 Big Data for Public Policies																																												
20 Technology and innovation incubator																																												
21 Digital Social Innovation Programme (DSI4BCN)																																												
22 Digital Technology entrepreneurship																																												
23 BCN Industry 4.0 Hub																																												
24 Pab Labs in the Technology Park																																												
25 Maker Faire Barcelona																																												
26 Making the neighbourhood: maker district																																												
27 Innovative public procurement																																												
28 Technology and innovation events																																												
29 Challenges and rewards																																												
30 Ecosystem of innovation																																												
31 Educational events																																												
32 Cloemirium																																												
33 Pab labs (ateneus de fabricacion)																																												
34 Jincies																																												
35 Digital education and digital social inclusion																																												
36 Digital commons for social inclusion																																												
37 Declaration of Barcelona for digital social inclusion																																												
38 Decidim barcelona																																												
39 Technology and gender																																												
TOTAL		3	0	2	1	0	1	1	11	5	1	0	4	2	5	2	25	12	16	5	12	18	0	14	6	3	3	3	3	1	18	10	4	7	12	6	0	1	34	27	2	2	16	12
Barcelona Digital City Challenges analysis		1	1.1	1.2	1.3	1.4	1.5	1.6	2	2.1	2.2	2.3	2.4	2.5	2.6	2.7	3	3.1	3.2	3.3	3.4	3.5	3.6	4	4.1	4.2	4.3	4.4	4.5	4.6	5	5.1	5.2	5.3	5.4	5.5	5.6	6	6.1	6.2	6.3	6.4	6.5	

Figure 55: Image of the classification table for challenges of Barcelona. See Annex 5 for more details.
Source: Authors own elaboration

6.3.4. Global vision and guidelines

Figure 56: Synthesis of the modifications made to the conceptual model in the analysis of implementation of the Barcelona Smart City strategy (2015). Values explained in sections 6.3.1., 6.3.2. and 6.3.3. Source: author's own elaboration.

The Barcelona Smart City initiative (Fig. 56) involves mainly political and economic stakeholders. It is focused in the adaptation of *governance* to technological innovations. However it presented a balanced approach to the other five dimensions. The initiative has a strong technological focus. Even if the strategy implementation reaches a balance among dimensions, this balance is not reflected in the way urban challenges are addressed. *Economic instability*, *social polarization* and *climate change* are addressed by a smaller number of projects.

Figure 57: Synthesis of the modifications made to the conceptual model in the analysis of implementation of the Barcelona Digital City strategy (2017). Values explained in sections 6.3.1., 6.3.2. and 6.3.3. Source: author's own elaboration.

In the Barcelona Digital strategy (Fig.57), political stakeholders gain weight and the balance among agents is increased. However, there number of involved economic stakeholders is still higher than knowledge and social agents. *Governance* keeps on being key and *governance* challenges are addressed. The initiative has a strong focus on *people* and *economy* but challenges of *social polarization* and *economic instability* are not directly addressed. Regarding the addressed challenges, *technology driven approaches to urban issues* is still the main one. On the other hand *climate change* is almost not being addressed and there is a reduced number of projects in the *environment* dimension.

Figure 58: Synthesis of the modifications made to the conceptual model in the analysis of the interviews developed in Barcelona. Values explained in sections 6.3.1., 6.3.2. and 6.3.3. Source: author's own elaboration.

The view of interviewed stakeholders shows a more balanced perspective of involved stakeholders, even if still leaded by political and economic agents (Fig. 58). There mentioned a bigger number of knowledge agents than of social ones. *Governance* is for them the most important dimension in the Smart City, and the *need of new governance models* is the second most important trend. *Environment* the second dimension in importance in their view of the Smart city, and *climate change* is the third trend in importance. However, all challenges important, in harmony with a more balance view. There is a lack of correspondence with *social polarization* being the most important trend according to stakeholders' opinions, and the *people* dimension. There are more initiatives focused on *living and services* than on *people*, while *social polarization* is considered to be more important than *global urbanization*.

The comparison of the three models has led to the development of a set of guidelines:

- **Increasing the balance among stakeholders.** Political stakeholders should have a protagonist role, but the other groups of stakeholders should be more balanced. This is already happening in the Digital strategy.
- **Governance: the core of the strategy.** *Governance* has kept on being the most important group of projects in both the Smart City and the digital strategies. It is not only the amount of projects that address it the way to address it. The digital strategy is proposing a switch from top-down to bottom-up approaches, making an effort in community building and in awareness rising a behavioral change. This is core of the strategy and makes an important difference regarding the Smart City initiative.
- **Reducing the focus on technology but considering the problem of technology governance.** The increasing importance of new technologies is the first group of challenges addressed by both the Smart city and the digital strategy. Yet it is the fourth in importance according to the interviewed stakeholders. For this reason, the focus on technology should be reduced. However, technology *governance* has appeared in the discourses of Barcelona stakeholders as an important topic, and even if reducing the focus on technology, this topic needs to be present.
- **Coordination with the environment projects to face climate change.** *Climate change* is the third trend in importance according to interviewed stakeholders. However the Digital strategy has reduced the amount of projects addressing it. This does not mean that these projects have disappeared, but they are coordinated by other areas (Ecología, Urbanismo y Movilidad). Nonetheless projects with a technological basis have an important potential for addressing *climate change* and even more if coordinated. Therefore, these projects should be re-included in the initiative or at least clearly coordinated with the digital strategy.
- **Living and services focusing to social polarization.** *Living and services* has passed from being the second to be the fourth group of projects in importance. However it should keep on having an important role and services should focus on *social polarization*, which is the key global trend according to interviewed stakeholders.
- **People and economy: redistribute efforts.** *People* and *economy* are becoming key for the transformation proposed by the digital strategy. However they are not so important for stakeholders, and sometimes the projects can be redundant focusing on the same areas when other dimensions are being reduced. The way in which the new approach is materialized in the other dimensions should be considered providing a bigger balance and bringing the strategy closer to stakeholders.

As a conclusion, to increase stakeholders' involvement making their vision more similar to the real implementation, Barcelona needs to maintain its evolution recovering some of the elements of the previous strategy. *Governance* keeps on being core and there is an important change in the focus. Linked to this change of view, *people* and *economy* are gaining importance. However, there is a need for reconnecting with the *mobility* and infrastructure and *environment* dimensions to answer the concerns of the interviewed stakeholders.

6.4. Comparative analysis of cities

A comparative analysis of cities is developed in this section. This analysis is divided into different parts: a general view, a comparison of the different main issues of the conceptual model facing them by pairs. Finally, a summary table is extracted

Graph 14: Comparison of the evolution of cities taking as a departure point the report “Mapping Smart Cities in the EU” and the initiatives before and after. Source: author’s own elaboration.

From the vision represented in the report “Mapping Smart Cities in the EU” (2014), the complexity of the strategies of the analyzed case studies has changed (Graph 14).

Vienna has increased both the number of projects and the complexity of them. Milan Smart city strategy presented in a first stage a bigger number of projects and a slightly higher complexity than the represented in the report, while Barcelona had a bigger number of projects but a lower level of complexity. However, Barcelona and Milan strategies had a similar evolution in the last years, reducing the number of projects and increasing their complexity. However, it is important to take into account that the report refers mainly to European funded projects.

The results of the application of the conceptual model to the surveyed cities (Vienna, Milan and Barcelona) is compared to extract common points and differences. The three cities in the two different stages, as well as the models that gathers the opinion of the different stakeholders, are displayed together to ease the comparison (See Fig. 59).

VIENNA

IMPLEMENTATION
(before)

MILAN

IMPLEMENTATION
(BEFORE)

BARCELONA

IMPLEMENTATION
SMART CITY IMPLEMENTATION
(now) IMPLEMENTATION
(NOW) IMPLEMENTATION
DIGITAL CITY

DISCOURSES

DISCOURSES

DISCOURSES

Figure 59: Comparing the different versions of the conceptual model for the different stages, discourses and cities analyzed. Source: Author's own elaboration.

A table that summarizes the numbers and shares has been developed too (Table 45).

		Vienna		discourses	Milan		discourses	Barcelona		discourses
		implementation			implementation			implementation		
		Before (2016)	Now (2018)		Before (2013)	Now (2017)		smart city (2015)	digital city (2017)	
Stakeholders	Political	59	51	76	43	16	36	45	43	37
	Economic	27	35	6	37	57	21	38	29	26
	Knowledge	12	9	13	16	14	13	9	12	20
	Social	3	5	5	4	13	31	8	16	17
	Maximun gap	56	47	71	39	44	23	37	31	20
Dimensions	Governance	18	20	29	30	18	18	26	28	20
	Economy	7	11	6	6	18	29	12	21	16
	Mobility and infrastructures	16	10	9	14	4	5	14	7	13
	Environment	28	27	12	12	11	17	16	3	19
	People	19	17	27	18	29	21	16	22	14
	Living	13	16	18	21	19	10	16	18	18
	Maximun gap	21	17	22	24	25	23	14	26	7
Global trends	Climate Change	26	41	19	9	12	17	13	3	17
	Social Polarization	9	16	18	14	18	19	18	24	19
	New governance models	11	9	17	16	8	18	11	10	17
	Global urbanization	25	17	16	32	25	15	23	13	14
	Economic Instability	7	4	15	2	16	15	10	17	16
	Technological innovations	21	14	15	26	22	16	27	32	16
	Maximun gap	19	37	5	30	17	4	17	30	5

Table 45: Table for comparing the shares in each of the main issues and the maximum gaps between maximum and minimum values. Source: Author's own elaboration.

Finally we are going to analyze the cities comparing the different main issues defined by the conceptual model: stakeholders, projects and challenges.

Political stakeholders are the most important in number in both Vienna and Barcelona and in Milan before, while in the current development of the Milan Smart City initiative, economic stakeholders are involved in a higher number. In Vienna and especially in Milan the relative weight of economic stakeholders is increasing, while in Barcelona it is decreasing. The weights of the different stakeholders is more balanced in Barcelona. Knowledge and social stakeholders are the third and fourth in importance in most cases (except for Milan now) and with a big difference from the other groups. However, when asking stakeholders, from their point of view, political stakeholders are the most important normally with a big difference with the other groups, which are more balanced. Milan constitutes an exception as stakeholders mentioned social

stakeholders as the second in importance. In Barcelona and Vienna they mentioned knowledge stakeholders as the third in importance, but in Milan they are the last group. The change on the approach to governance has also occurred in the cities, especially in Barcelona, to a bottom up approach, and this has an influence in the evolution of stakeholders' groups' importance and it is not well represented by the model.

Governance varies its weight, it has increased in Vienna (from the third to the second), significantly decreased in Milan (from the first to the fourth) and its relative weight has been maintained in Barcelona (being the first). In the views of stakeholders it is the most important dimension in Vienna and Barcelona, but the third in Milan, so cities have followed the discoursed of stakeholders.

Milan and Barcelona have a similar evolution in the weights of the dimensions, switching to *people* and *economy* and maintaining *living and services* as an important element. The big difference is that Barcelona has kept the focus on *governance*. According to the analysis of projects, it seems that the two dimensions of *people* and *economy* are growing correlated through projects that foster economic development based on human and social capital. This is coincident with the opinion of interviewed stakeholders in Milan, but not in Barcelona. Vienna has also increased the focus on *economy* even if it is among the last ones in importance, but it has not increased the weight of *people*, that was already the second dimension in importance, as in the opinion of interviewed stakeholders.

Environment is the most important dimension for Vienna now and before. But in the case studies of Milan and Barcelona it is much less important, being the fifth dimension in importance now, and in the case of Barcelona even losing weight with time.

However, according to the opinion of interviewed experts, *Climate change* is the third global trend in importance in Milan and Barcelona and the first in Vienna. Therefore the evolution in the cities of Milan and Barcelona is not responding to the opinion of the different stakeholders.

The global trends of Social polarization and the *need of new governance models* are the first and second in Milan and Barcelona, and they are the second and third in Vienna. This fact does not always get a proper answer from the Smart City initiatives, as *governance* is reducing its weight in Milan and *People* is slightly reducing its weigh in Vienna. Technological innovation, *global urbanization* and *economic instability* are the less important challenges to stakeholders in all cities. The low values of *economic instability* as a global trend contrast with the change of focus of the initiatives of Milan and Barcelona.

A summary table of the shares in stakeholders, projects dimensions and global trends was developed to serve as a basis for comparison. It also included the maximum gap between the maximum and minimum values in each of the main issues.

6.4.1. Stakeholders vs. dimensions

The general approach related to stakeholders and dimensions reflects to main changes. Firstly a loss of political weight (even being surpassed by economic stakeholders in Milan) meant a rebalance on the shares of stakeholders for Barcelona and Vienna. Secondly, a change in the profiles reducing *environment* and *mobility* dimensions and increasing the *economy* dimension. However, there are many particularities in this general description.

Vienna is the city in which political stakeholders present the biggest share. It is also the initiative that has maintained during time their profile, keeping a similar distribution of projects among the dimensions through a strong leadership. This can be considered as something positive, but also has a negative side. Vienna initiative was not able to change its profile according to the vision of stakeholders, putting more weight in the *People* and *Governance* dimensions and reducing the projects focused to *Environment*. Milan has strengthened the leadership of the Economy department on the initiative, and Barcelona has changed government. They both made an important change in the shares of involved stakeholders. For these reasons their initiative has not maintained their profile, changing their distribution of projects among the dimensions.

Therefore, Milan and Barcelona were able to change the focus of their strategies, while involving different stakeholders. However, in both cities the *environment* and *mobility* dimensions were drastically reduced.

An important conclusion is that a bigger balance among stakeholders does not necessarily mean an increase of the balance of dimensions inside the strategies. This only happened for the city of Vienna, while Barcelona increased the balance among stakeholders while the initiative became more unbalanced being refocused to certain dimensions. For the case of Milan, both the share of stakeholders and projects affecting dimensions are more unbalanced now than before.

The governance dimension increases its relative weight in Vienna and Barcelona, coinciding with discourses. Meanwhile, political stakeholders slightly lose weight, increasing the balance with other stakeholder's groups. However, this positive relation does not always occur. In the city of Milan, the decrease of political involvement is related to an increase of economic stakeholders and not to a bigger balance. Related to this change, there is a decrease of projects in the governance dimension.

In the case of Barcelona, projects included in the *economy* dimension increased, without this implying a bigger share of economic stakeholders involved. Economic stakeholders increase their

share in Milan (taken the lead in number) and Vienna, in the last one against the opinion of stakeholders. In both cities, this is related to an increase of projects in the *economy* dimension, especially in Milan. In both cities the *knowledge* stakeholders have reduced their share.

The reduction of the *environment* and *mobility* dimensions might be interrelated. In the case of *environment* is not rated among the most important for stakeholders neither in Vienna or Milan, but *mobility* is not considered among the most important dimensions in any city. In Milan and Barcelona these dimensions were drastically reduced in number of initiatives. Stakeholders do not perceive them as important (except for *environment* being considered as important in Barcelona), but it is not clear how the changes in shares of stakeholders involved is related.

The increase of social stakeholders is related to an increase of projects in the *people* dimension, but only if the change of the share of stakeholders is significant. In Milan and Barcelona, where the increase of involvement of social stakeholders is significant, the *people* dimension increased its importance. But the reduced increase of social stakeholders in Vienna (from 3% to 5%) is not linked to an increase of the People dimension (against the opinion of stakeholders).

Vienna and Barcelona, the cities that increased the balance among stakeholders, have slightly increased their efforts in the living dimension. The share of projects affecting the living dimension was reduced in Milan, the city with a less balanced distribution of stakeholders.

6.4.2. Dimensions vs challenges

No clear correlation exists between the increase of balance among projects dimensions and the share of projects addressing the different challenges, grouped by global trends. In Milan, the decrease of balance among dimensions (close to the idea of stakeholders) is linked to an increase of balance among challenges addressed (as stakeholders propose). However, the opposite happened in Vienna: the increase of balance in dimensions was not linked to an increase on the balance among challenges. But in this case both things happened against the visions of stakeholders. In Barcelona, the reduction of balance took place in both the shares of dimensions and challenges (both against the opinions of stakeholders). Results seem to be more positive when they go with the opinions of the stakeholders, but there are not enough case studies to confirm this conclusion.

Projects on the governance dimension increased in Vienna and Barcelona and decreased in Milan, following the opinion of stakeholders. Meanwhile, projects facing governance challenges are considered among the most important ones in Milan and Barcelona, and of intermediate importance in Vienna. The projects facing governance challenges reduce their relative weight in all cities against the opinion of stakeholders. A slight increase of governance projects is not being enough for Vienna and Barcelona, while they are reducing their relative effectiveness to address the challenges, while in Milan the gap increases even more.

Efforts in improving the *economy* dimension are worthy. Projects in the *economy* dimension increases a little bit in Vienna and remarkably in Milan and Barcelona, while economic instability is addressed by a much bigger share of projects than before in Milan and Barcelona, but by a smaller share in Vienna. Small efforts at increasing the share of projects in *economy*, like in the case of Vienna, are not being effective. A stronger effort is necessary for getting results.

The share of projects facing technological challenges only increased in Barcelona. Projects in the mobility and infrastructure dimensions were reduced, so challenges are being addressed through other dimensions. The number of projects addressing technological challenges decreased in Milan and Vienna. There is a lack of awareness as stakeholders do not consider them as important.

Slight reduction on the percentage of projects in environment in Vienna and Milan. This follows the opinion of stakeholders in Vienna (even needing to make a bigger reduction), but a little increase is necessary in Milan. However, both cities, and specially Vienna, increased the projects addressing climate change, suggesting an increase on the efficiency and a transversal approach to this group of challenges. Climate change challenges are among the most important in Vienna but the third in Milan. The number of projects in environment decreased in Barcelona. The share of projects focusing on climate change was also reduced, against the opinion of stakeholders that consider climate change challenges the second ones in importance. Other projects are almost not addressing climate change challenges, losing an opportunity.

Increase on projects addressing *social polarization* in all cities. In Milan and Barcelona this is linked to an increase of the share of projects on *people*. *People* projects considered very important in Milan and Vienna, not that much in Barcelona. In Barcelona, *social polarization* is the most important challenge to be faced. Vienna would need to increase the projects in the *people* dimension to materialize the opinion of stakeholders

Reduction of projects addressing the problems of *global urbanization* in all cities. This group of challenges is among the last ones in importance for stakeholders. There is a slight increase of projects in the living dimension in Vienna and Barcelona, but their efficiency decreased.

6.4.3. Stakeholders vs challenges

There is also no clear correlation among the increase of balance among stakeholders and the increase of balance among projects addressing challenges in the different social trends. The balance among stakeholders increased in Barcelona and Vienna, but the balance in projects addressing the different challenges only increased in Milan.

While political stakeholders are reduced, governance challenges are being addressed by a smaller share of projects in a proportional relation. The reduction is very important in Milan, but it is also important for Vienna and Barcelona. Political stakeholders are reduced and governance

challenges are being addressed by a smaller number of projects. The reduction of the share of projects focusing on governance challenges goes in all cases against the opinion of stakeholders.

The share of economic stakeholders in Barcelona decreases, but the number of projects addressing *economic instability* increases. This points out an increase of effectiveness. Meanwhile, the increase of economic stakeholders in Vienna and Milan has different results. In Milan, this led to a greater share of projects focused on *economic instability* challenges, but in Vienna it had the opposite effect.

The share of projects addressing *climate change* challenges increased in Milan and Vienna. Meanwhile, the share of political and knowledge stakeholders decreases in both cities and of economic and social increase. In Barcelona the number of projects addressing climate change decreases, as well as the share of political and economic stakeholders, increasing the other ones. Stakeholders of Vienna and Barcelona consider climate change among the first challenges to be faced.

While this happens, the share of projects addressing technological innovation increases in Barcelona (against the opinion of stakeholders) and decreases in Vienna and Milan (where it has a low and average importance for stakeholders respectively). The share of projects addressing problems of *global urbanization* decreases in all cities following the opinions of stakeholders. There might be a lack of awareness about the importance of these challenges.

All cities have increased the share of projects affecting *social polarization*, reducing the gap with the opinion of stakeholders. In all cases, the share of social stakeholders increased in parallel. In Barcelona, and especially in Milan, the share of social stakeholders should increase even more according to the opinion of interviewed stakeholders.

6.4.4. Summary

Finally, as a summary of transversal conclusions was developed for the extraction of global conclusions (Table 46). This table divided the positive and negative correlations in the comparison of the main issues defined. It is based in the traditional SWOT analysis (Strengths, Weaknesses, Opportunities y Threats), but instead of using the division of internal and external, focuses on the relations among layers of the conceptual model.

	Positive	Negative
stakeholders vs. dimensions	Greater balance on the shares of stakeholders for Barcelona and Vienna.	Loss of relative weight of political stakeholders (even being surpassed by economic stakeholders in Milan)
	Increase of the share of projects in the economy dimension in all cities	Reduction of the share of the environment and mobility dimensions (but only slightly in Vienna).
	Important change in the shares of involved stakeholders in Milan and Barcelona > change the focus of their strategies, while involving different stakeholders (linked to changes on leadership on the initiative).	Milan and Barcelona: drastical reduction of the environment and mobility dimensions
	Vienna: biggest share of political stakeholders > similar distribution of projects among dimensions during time.	Vienna initiative was not able to change its profile according to the vision of stakeholders (increase of projects on people and governance dimensions, more reduction in environment)
	Bigger balance among stakeholders does not necessarily meant an increase of the balance of dimensions: only in Vienna	Barcelona increased balance among stakeholders> less balanced dimensions. Milan: both share of stakeholders and projects affecting dimensions are more unbalanced now than before.
	In Vienna and Barcelona: Governance dimension increases its relative weight, coinciding with discourses; political stakeholders slightly lose weight> increase of balance among stakeholders	Milan: decrease of political involvement while increase of economic stakeholders (lead in number now) and not bigger balance; decrease of projects in the governance dimension.
dimensions vs challenges	Barcelona: increase of projects included in the economy dimension, reduction of the share of economic stakeholders.	Milan and Vienna: Increase on the share of economic stakeholders > increase of projects in the economy dimension, especially in Milan; reduction on the share of knowledge stakeholders.
	Reduction of the environment and mobility dimensions in all cities. Mobility is not rated among the most important for stakeholders in any city, environment only in Barcelona.	Milan and Barcelona drastical reduction of projects in mobility and environment. In Barcelona the reduction of projects in environment goes against the opinion of stakeholders.
	The increase of social stakeholders is related to an increase of projects in the people dimension, but only if the change of the share of stakeholders is significate. In Milan and Barcelona, where the increase of involvement of social stakeholders is significant, the people dimension increased its importance.	But the reduced increase of social stakeholders in Vienna (form 3% to 5%) is not linked to an increase of the People dimension (against the opinion of stakeholders).
	Vienna and Barcelona, the cities that increased the balance among stakeholders, have slightly increased their efforts in the living dimension.	The share of projects affecting the living dimension was reduced in Milan, the city with a less balanced distribution of stakeholders.
	Milan: decrease of balance among dimensions (close to the idea of stakeholders) > increase of balance among challenges adressed (as stakeholders propose).	Vienna: increase of balance in dimensions not increased balance among challenges (both against opinions of stakeholders) . Barcelona > more unbalanced share of dimensions > more unbalanced share of challenges (both against opinions of stakeholders)
	Governance dimension increased in Vienna and Barcelona and decreased in Milan, following the opinion of stakeholders. Governance challenges: among the most important ones in Milan and Barcelona,intermediate importance in Vienna.	Governance challenges reduce their relative weight in all cities against the opinion of stakeholders. Milan and Barcelona: A slight increase of governance projects > reduction of their relative effectiveness . In Milan the gap increases even more.
stakeholders vs challenges	Milan and Barcelona: big increase of economy dimension > much bigger share of projects adressing economic instability.	Vienna: small increase of economy dimension> smaller share of projects on economic instability: need of a bigger effort.
	Barcelona: increase of projects facing technological challenges; reduction of projects in the mobility and infrastructure dimensions	Milan and Vienna: decrease of projects addressing technological challenges <>lack of awareness of stakeholders
	Slight reduction of environment dimension in Vienna and Milan while increase of projects addressing climate change: increase of efficiency and a transversal approach. Contradictory opinion of stakeholders on this topic	Barcelona: decrease of environment dimension and of projects focusing climate change (against the opion of stakeholders).
	Increase on projects addressing social polarization in all cities. In Milan and Barcelona: increase of the share of projects on people. People projects considered very important in Milan and Vienna, while in Barcelona, social polarization challenges are the most important.	Vienna would need to increase the projects in the people dimension to materialize the opinion of stakeholders
	Global urbanization: Reduction of projects in all cities, among the last ones in importance for stakeholders.	Vienna and Barcelona: slight increase of living dimension projects share while reduction of projects in global urbanization > reducing efficiency.
	Increase of the balance among stakeholders in Barcelona and Vienna, and increase of the balance in challenges in Milan.	There is no correlation among the increase of balance among stakeholders and the increase of balance among projects addressing challenges in the different social trends.
stakeholders vs challenges	Correlation between the share of political stakeholders and the share of governance challenges addressed.	In all cities: redution of political stakeholders, reduction of projects addressing governance challenges proportionally (against the opinion of stakeholders). More significant in Milan.
	Share of economic stakeholders in Barcelona decreases, but projects addressing economic instability increases: increase of effectiveness.	In Milan, this led to a greater share of projects focused on economic instability challenges, but in Vienna it had the opposite effect.
	Share of projects addressing climate change challenges increased in Milan and Vienna. Shares political and knowledge stakeholders decrease in both cities, share of economic and social stakeholders increase.	Barcelona: projects addressing climate change decrease, share of political and economic stakeholders, increasing the other ones. Stakeholders of Vienna and Barcelona consider climate change among the first challenges to be faced.
	Share of projects addressing technological innovation: increases in Barcelona (against the opinion of stakeholders) and decreases in Vienna and Milan (low and average importance for stakeholders respectively).	Projects addressing problems of global urbanization decreases in all cities following the opinions of stakeholders. There might be a lack of awareness about the importance of these challenges.
	All cities: increased the share of projects affecting social polarization, reducing the gap with the opinion of stakeholders. In all cases, the share of social stakeholders increased in parallel.	In Barcelona, and especially in Milan, the share of social stakeholders should increase even more according to the opinion of interviewed stakeholders.

Table 46: summary of transversal conclusions. Source: author’s own elaboration

6.5. Stakeholder's visions in Europe

Graph 15: Classification of terms included in Smart City definitions by interviewed political stakeholders.
Source: Author's own elaboration.

Conclusions have been extracted from the analysis of Political stakeholders (Graph 15). *Governance* is the most important dimension, followed by *economy* and *environment*. *Technology* is considered as a wide term, not focusing on specific technologies, and stakeholders are specially focused on it as a *tool*. The goals that are more important are facing the urban *challenges*, the *integration* and the *improvement*. *Quality of life* and *efficiency* are considered equals in importance to *citizen centric approaches*, and more than *sustainability*.

Graph 16: Classification of terms included in Smart City definitions by interviewed economic stakeholders.
Source: Author's own elaboration.

Economic stakeholders (graph 16) use a great amount of terms referred to *people*, but on a top-down vision (for example, they never mentioned *engagement and empowerment*). For them, the second dimension in importance is *environment*, followed by *mobility* and *governance*. They also

have an open view of *technology*, using the generalist term, and they are specially focused on *innovation*. According to economic stakeholders, the main objective of a Smart City is the *improvement* and the increase of *efficiency*. Having an *integrated* view of the Smart City is also important to them.

Graph 17: Classification of terms included in Smart City definitions by interviewed knowledge stakeholders.
Source: Author's own elaboration.

The most important dimension for knowledge stakeholders is *governance* (Graph 17). It is followed by *environment* and *people*. They have an open view of *technology*, understanding it as a *tool*. They also usually referred to *data* and *big data*. They repeated the idea of that a Smart City is *not only technology* (8 times). The idea of *improvement* is also quite present in their definitions, being the main objective of Smart Cities. They also consider as very important the *citizen centric approach* and the idea of the Smart City as a *concept*.

Graph 18: Classification of terms included in Smart City definitions by interviewed social stakeholders.
Source: Author's own elaboration.

The terms linked to *living* followed by *governance*, are the most important ones according to the definitions of social stakeholders (graph 18). The other four dimensions are mentioned in a balanced way. The goal of *improvement* (mentioned 15 times) is also quite present in their definitions. *Quality of life* is the second goal in importance. *Sustainability* and the idea of *integration and holistic approach* are the third and fourth goals appearing in the definitions of social stakeholders. They see technology mainly as a *tool*, having wide point of view of *technology* instead of mentioning specific technologies. *Data* and the idea of *connection*, as well as the *digital-physical* contrast, are also present in their definitions.

Figure 60: Synthesis of the modifications made to the conceptual model in the analysis of political stakeholders discourses. Source: author's own elaboration.

The point of view of the political stakeholders in the different studied cities is synthetized in this model (Fig. 60). They mentioned a significant number of political stakeholders, while the other groups were mentioned in a smaller number, led by the economic stakeholders. Their view of the Smart City is specially focused on the *governance* dimension. The other dimensions are quite balanced, even when *environment* and *economy* are more present in their definitions. However, the term *mobility and infrastructures* is clearly mentioned a smaller number of times. Regarding the challenges that cities must face, they have a balanced view. *Social polarization* and *climate change* are punctuated as more important for them.

Figure 61: Synthesis of the modifications made to the conceptual model in the analysis of economic stakeholders discourses. Source: author's own elaboration.

The point of view of economic stakeholders have both differences and coincidences with the one political agents (Fig. 61). For them political stakeholders are the most important ones, but they are closely followed by economic stakeholders. Social and knowledge stakeholders are mentioned fewer number of times. It is important to highlight that most of the definitions provided by economic stakeholders are shorter and more specific, so they gather a smaller number of terms. When looking at the dimensions mentioned in their definitions, their vision is very unbalanced. *People* is the dimension that appears more frequently in their definitions, referring to education and knowledge, directly mentioning *people* or *people* together, human and social capital, etc. *Environment* is the second dimension in importance, followed by *mobility and infrastructures* and *governance*. Regarding the challenges cities must face according to economic stakeholders, *Social polarization* is the first trend in importance, followed by the *need of new governance models*. *Technological innovations* and *economic instability* would be the third trends in importance. Therefore, their view of *social polarization* as the key trend to face is coherent with their vision of *people* as the most important dimension. Other aspects have less coherence, as for them the *need of new governance models* is the second trend in importance while *governance* is not so relevant in their vision, or *climate change* is one of the trends rated as less important while the *environment* dimension is the second in importance.

Figure 62: Synthesis of the modifications made to the conceptual model in the analysis of knowledge stakeholders discourses. Source: author's own elaboration.

Political stakeholders are for knowledge stakeholders the most important agents in the Smart City. Knowledge stakeholders are the second ones in importance (Fig. 62). Social stakeholders have for them more presence in their Smart City vision than economic agents. *Governance* is the key dimension for them, closely followed by *environment*. *People* and *economy* are also important for them, while *living and services* and *Mobility and infrastructures* are clearly much less significant. Their view of dimensions is coherent with the challenges cities must face. The *need of new governance models* and *climate change* are the more important trends for them, while *global urbanization*. *Economic instability* and *technology driven approaches to urban issues* are the less important ones.

Figure 63: Synthesis of the modifications made to the conceptual model in the analysis of social stakeholders discourses. Source: author's own elaboration.

For social stakeholders, their own group is the most important one, followed by political stakeholders (Fig. 63), while knowledge stakeholders and economic stakeholders have much less weight. *Living and services* are the most important dimension, followed by *governance*. The other four dimensions are more balanced. *Social polarization* and *climate change* are the most important trends for social stakeholders, which is not so coherent with their view of the smart city. Maybe they do not see the smart city as a solution for the most important urban challenges, understanding it as a tool for the provision of services. This could be one of the reasons of their lack of involvement (and sometimes, lack of interest) in Smart City initiatives.

When we compare the four visions, we see that there are important differences among the vision of the different stakeholders groups. These differences are especially outstanding regarding their view of the dimensions of the Smart City. At first sight the vision of political stakeholders is more similar, even if knowledge is more balanced. The vision of economic stakeholders is the one that at first sight differs more from the other.

When looking at the visions of the stakeholder's groups, some points are similar among the different views and to the analysis of Smart Cities' implementation. The group of political stakeholders is the first one for all of them except for the social stakeholders. This is also coincident with the definition provided by the EU advisors (Manville et al, 2014). In this analysis it is important to highlight that groups tend to self-reference, placing their own group the first or the second one in importance when mentioning other stakeholders. Economic stakeholders are

the second in importance for both political and economic stakeholders. Knowledge and social stakeholders have a smaller importance for other groups.

The view of Smart city dimensions is the one that presents the most important differences among the interviewed groups. There are differences in the importance given to the different dimensions, but also in the balance reached among the different dimensions. Political stakeholders view is relatively balanced, even if *governance* is the most important dimension. For economic stakeholders, *people* is the goal in their definitions, but their vision is unbalanced. Knowledge agents focus on *governance* and *environment*, while social stakeholders focus on *living and services* but have a more balanced approach to the dimension. *Governance* is the first dimension in importance for knowledge and political stakeholders, while it is the second for social agents. *Environment* is the first dimension for knowledge stakeholders, the second for political and economic stakeholders and the 4th for social stakeholders. The weight of *mobility and infrastructures* is quite reduced in political and knowledge definitions. *Economy* is more important for political stakeholders than for any of the other groups.

The view of the global trends that affect cities nowadays is balanced in all the stakeholders' views. The wider gap is in knowledge stakeholders questionnaires. *Social polarization* is the most important trend according to three of the groups: political, economic and social stakeholders. Climate change is the first for knowledge and the second for political and social agents, but it is among the last in importance for *governance* stakeholders. *Governance* challenges are the second in importance for knowledge and economic stakeholders, third in importance for social stakeholders, but the 5th for political agents. Economic instability is the last in importance for political knowledge and social stakeholders, while it has a middle importance for economic stakeholders.

6.6. General guidelines for Smart Cities in the European Region

At the beginning of this section, the representativeness of the three selected cities in the European Region was presented. Therefore, guidelines for Smart Cities in the European Region are developed taking the accomplished analysis of each of the cities as a departure point.

- **The governance core: balance of stakeholders leaded by local government.** This research has focused on the Smart City municipal strategies of the selected cities. In all analyzed cities before and now, with the exception of Milan in the present moment, political stakeholders were the main *governance* agents. This is logical taking into account that we are talking about municipal strategies and not about the general state of projects in the city. However in many of the cases there was a very big difference in the number of involved stakeholders from other groups, among them and with the political stakeholders. This is coincident with the European Commission report (Manville et al., 2014) that definition of the Smart City as “a multi-stakeholders’ municipally-based partnership”. Surveyed agents opinions are coincident to highlight the importance of political stakeholders. However their visions of the other agents’ groups is much more balanced. The suggestion is to maintain the importance of political stakeholders and their leading and coordination role. But reducing the gap of political stakeholders with the other agents groups, reducing the number of political stakeholders and increasing the involvement of the other groups. A strong leadership can make the initiative last in time but can reduce its capacity to answer to changing demands, like in the case of Vienna. The balance among stakeholders does not imply an increase of balance in projects dimensions or in addressed challenges. This will depend on the needs of the city.
- **New governance models at the core of the Smart City.** The proposed Smart city conceptual model placed *governance* at the core to reflect the importance of it in the materialization of the Smart City. This importance has been confirmed by the different analysis. The *need of new governance models* is one of the main concerns expressed by interviewed stakeholders. Therefore, it is not only the weight of the *governance* dimension what needs to be taken into account. The Smart city strategies are experiencing a *governance* model change. New models that combine a top-down vision to a bottom-up approach are being incorporated. This change is the basis for the deep transformation that the strategies of cities like Milan and especially Barcelona are experiencing. It needs to be taken into account in future smart cities. New efforts on *governance* projects should be made, incorporating this new concepts, as projects are reducing their share against the opinion of stakeholders.
- **Smart City is not only technology, but technology governance is the key.** The point of view of the different stakeholders about technology in the city has been wide, mentioning mainly technology (instead of specific technologies like ICT, sensors or big data). They insisted in

the idea of the Smart City being “not only technology”. Very frequently they have mentioned the idea of technology as a tool. But to use technology as a tool, technology *governance* is key. This topic is starting to be important in the proposal of Barcelona Digital city, is key. The *governance* of technology needs to be strong and involve all stakeholders. Even if this is important for the Smart City, the trend “*technology driven approaches to urban problems*” is among the last ones in importance to agents in all cities, but technology is a driver for changes that will be proposed. Therefore, it is not a general problem, but a problem that attains the Smart city. Awareness and training is also key to give this aspect its proper role..

- **Balance among challenges faced is not related to the need of balance among dimensions, but to getting closer to the visions of stakeholders.** The Smart City is an answer to urban challenges. The view of the different agents regarding the urban challenges is common across cities and stakeholders’ groups: all urban challenges are important. Therefore, the Smart City should provide a balanced answer to urban challenges. However, there a holistic and multi-dimensional approach does not imply that the answer should be given by a balance among dimensions. The comparison of dimensions and challenges showed an inverse relationship between balances on dimensions and balances of challenges in Vienna and Milan, and a bigger success at addressing urban challenges when the profile of the initiative was closer to the opinion of stakeholders.
- **The will of each city: involving stakeholders in key ideas definition and increasing awareness on the strategies.** Although the balance proposed in the previous guideline, cities can try to define a strategy that makes a greater effort in a specific area. If this happens, and effort should be made in the involvement of stakeholders in decision-making, as well as their awareness during the development of the strategy. This can help to bridge the existing gap between the visions of the different stakeholders and the strategies developed. Cities should have specific profiles for their needs and the visions of their agents.
- ***Social polarization*: the main challenge of the Smart City.** To reach the involvement of stakeholders it is important that the Smart City becomes an answer to their concerns. *Social polarization* has been considered among the first trends in importance by all stakeholders groups. Therefore, the Smart City needs to provide a response to the growing gaps among social groups in cities. To reach it is a challenge itself, as the Smart City has been accused by multiple authors to increase social gaps (Deakin, 2011; Hall, Braverman, Taylor, & Todosow, 2000). Therefore, special efforts should be made to reach the transformation. The evolution of the cases of Barcelona and Milan shows efforts in this direction.
- **New approaches to the provisions of services.** The balance of stakeholders can be linked to an increase of the effort in the Living dimension. But on the opinion of stakeholders, the

problems of global urbanization and the provision of services are not among the first ones. New approaches linked to the changes in governance should be implemented, involving agents in the provision of public services and not only in their use, giving it a new value.

- **A Smart City starts in *People* while including civil society in the Smart City.** The *people* dimension is increasing its weight in the initiatives of Milan and Barcelona, but not in Vienna. This was related to a big increase of social stakeholders in the first cities and of a much smaller increase in Vienna. A big effort in civil society involvement should be made to obtain results. This is an opportunity to face *social polarization* through strategies that focus on inclusion and equity. It is also an opportunity to produce a change in the conception of innovation in cities introducing projects on social innovation. When talking about technology in cities, especial attention should be paid to technology accessibility, overcoming the digital divide. This change is also tightly linked to the increasing importance of the *economy* dimension.
- **Economic development supported by social and human capital to address economic instability.** The *economy* dimension is gradually gaining importance in the initiatives. This change is related to the growing weight of *People*. There is a growth in the initiatives that foster economic alternatives based on social and human capital. *People* is the most important dimension according to the definitions provided by the interviewed economic stakeholders. This can be due to this change, but also to marketing purposes, aiming to adapt their discourses to the changes in the city strategies. As an example, the city of Milan involved an increasing number of economic stakeholders and the result is a strategy that focuses mainly on *people*. And in the case of Barcelona, the dimension economy was boosted with a parallel reduction of economic stakeholders involved and an increase of social actors. Therefore a change in the approach to economic projects in the city is key. Increases in the economy dimensions together with people, like in the case of Milan and Barcelona, increased the efficiency at addressing challenges focused on economic instability.
- **Need of new and transversal approaches to environmental problems.** *Climate change* is among the most important global trends according to interviewed stakeholders, but when it comes to the challenges scale they do not see them as important. Environmental issues (though energy and mobility) were the departure point of the Smart City. However it has been difficult to involve citizenship in this conceptualization. Vienna constitutes an example of this difficulty. Its Smart City initiative was and keeps on being clearly focused in the *environmental* aspect. However, interviewed stakeholders do not see the *environment* dimension among the main ones. There is a need of awareness and involvement of citizenship and stakeholders in the projects and initiatives in the *environment*. The slight reduction of the *environment* dimension in Vienna and Milan (according to the opinion of stakeholders) occurred in parallel

to the increase of projects addressing climate change: increase of efficiency and a transversal approach. It is necessary to approach climate change issues from all areas, making them closer to daily issues and to make citizenship understand that their role is important in providing solutions to environmental problems.

- **Increasing the awareness on *mobility*.** As another aspect of this, *mobility* is not present in the discourses of stakeholders. However, it is a key element for facing urban *environmental* challenges. The reductions on the share of projects on environment is linked to a even bigger reduction of projects on mobility. All case studies are reducing the focus on *mobility*. Changes in the *mobility* patterns have an important impact not only in the environmental challenges, but also in challenges like *social polarization* or *global urbanization*. This trend should be reversed. Involving stakeholders and fostering changes in their perception of *mobility* is key for the success of the Smart City.

As a conclusion, understanding the Smart City as an answer to urban challenges, balance seems to be the key. A better balance among stakeholders, even if leaded by political stakeholders. And a better correspondence between projects developed and challenges addressed. But not necessarily a better balance among dimension, that will depend on the will of the city. This can be achieved moving forward and making changes in the strategy, but the previous developments of the initiative and the work that has already been done should not be forgotten. The potential of the Smart City strategy to integrate all areas should be used and enhanced.

These general guidelines are extracted from the comparison of the guidelines proposed in the different analyzed cities. However, this proposal has its own limits. The Smart City strategy should answer the specific problems of each city. For this reason, these guidelines should be adapted to each city in order to respond to the objectives of the city and be aligned with the other initiatives being developed in the city.

CHAPTER 7. CONCLUSIONS

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This final chapter discusses the conclusions of this research. It includes some insights extracted from the different articles published by the author, but it is mainly an answer to the objectives and hypothesis proposed at the beginning of this research.

The aim of this research was triple: (A) to design an integrative and comprehensive conceptual model for Smart Cities, and (B) to propose a methodology to analyze the implementation of Smart Cities and the discourses and (c) to extract guidelines to develop initiatives in the field. Therefore conclusions are going to be organized according to these objectives. The validation of the hypothesis will be discussed. General conclusions are extracted and future research is proposed.

7.1. Conclusions about the conceptual model.

The proposed conceptual model meets the requirements of an integrated Smart City conceptual model as defined in literature: it is an abstract representation of a complex reality according to a selection of principles. It establishes relationships between the three topics identified: (a) the importance of governance and stakeholders, (b) the integration of dimensions linked to the projects and initiatives implemented, and (c) the connection of these elements with the cities' challenges. The model highlights the importance of a comprehensive view of the Smart City that takes all these different aspects into account. Due to this complexity, a step-by-step development is necessary to extract conclusions and integrate them in a final phase.

The main strength of the model is its capacity to synthesize the Smart City complexity. It is able to simplify multiple aspects of the reality of the Smart City in a comprehensive figure. It includes and interrelates concepts that have been widely debated in the Smart City discussion. It has a strong basis on scientific literature on the topic, but it is also able to explain what is really being done in the city. It connects with a reality that goes beyond the Smart City: the challenges cities are facing and the involvement of stakeholders in the strategies to solve them. Therefore, the model is not limited to Smart cities and can be reinterpreted in further researches in order to represent other concepts. The model was able to comply the four requirements established by Kuhn and Solvberg (1986): it helped the individual's understanding of the system and synthesized the opinions of stakeholders reaching an agreement among them. It was able to represent the system in different stages and to extract guidelines from the model.

The limits of the conceptual model are linked to the idea of the middle range theory. Therefore, the limits are twofold: on the one hand, it does not represent an innovative generalist theory about the Smart City conceptualization. It assumes the previous theory on the field and aims to synthesize and interrelate it following the trend of the holistic approach to the Smart City. On the other hand, it is a macro representation of the city and it does not achieve a level of detail that

allows the exhaustive empirical analysis. This model is not a mathematical model and is not prepared for complex simulation. However, a simple numerical approach has been developed to allow the use of the tool and its combination with indicators can lead to its transformation in an efficient assessment tool.

7.2. Conclusions about the use of the tool

The conceptual model proved to be useful for showing the past and current state of implementation and stakeholders' opinions/perceptions/assessments of the Smart City Strategy in the different analyzed cities. The methodology developed for the use of the conceptual model as a tool is also of great importance and has also proved its efficacy. It allowed the comparison of the implementation and discourses about the strategies and the identification of the common points and differences between them. It also demonstrated the usefulness of the tool for displaying all the interrelated elements in the conceptual model and extracting guidelines to narrow the gap between the two visions. The model succeeds in representing the stakeholders in the initiative and their perceptions of their involvement.

However, future research should pay special attention to public participation, and to future visions of stakeholder involvement. Stakeholders' opinions of the challenges facing Smart Cities shows a more balanced perception of the importance of the different dimensions. This idea is present in the literature and can be seen in actual implementation. The conceptual model highlights the lack of correspondence between the equal prioritization of challenges and the unbalanced development of the dimensions.

The model was also effective at representing a complex vision to the different stakeholders interviewed. It supported the debate with the stakeholders and was a useful tool for guiding the analysis of a thoroughly complex topic. It was especially valuable for local governments and private companies who have a comprehensive vision of the Smart City system in their work. They confirmed that the conceptual model reflects their complex vision with its interrelated elements in a systematic way, and considered the model could help them express their ideas more clearly to others.

The tool has included governance and stakeholders in the center. Its use has been focused on representing their opinion faced to the implementation of the concept through projects. The tool has been used in the four different considered groups: political, knowledge, social and economic stakeholders. However, it has not been proved with citizenship as it would require a specific methodology. Attention should be paid to the adaptation of the model to this purpose for its complete validation.

7.3. Conclusions about the analysis results.

The Smart City confirmed its holistic character providing complex answers to urban problems. There exist positive and negative correlations among the main issues considered in this research: stakeholders, Smart City projects and challenges addressed. In general terms, the global terms need to have balanced answers, and the balance among stakeholders is contributing to it. But when it comes to the materialization of the initiatives, balance is not always the answer. The complexity of the Smart City allows it to face challenges through different kinds of projects. The result of the research shows that the Smart City can evolve in time to adapt its answer to changing challenges. Every city has a different profile and listening to stakeholders can maximize the results. Following this ideas, guidelines for each of the cities have been developed. Extracting the common points of the analysis, guidelines for cities in the European Region have been developed.

The model has proved its usefulness at extracting specific guidelines for each of the analyzed cities. The comparison among stakeholders' involvement, projects and challenges has led to conclusions that propose new ideas for the future development of the analyzed cities. These ideas take as a basis the opinion of the interviewed agents. Furthermore, it also connects with previous stages of the initiative, considering that this will ease the development of the changes proposed to the strategies. As we move forward, sometimes it is also important to look back and give a new value to what has been done. The trajectory of the initiatives is sometimes better accepted by stakeholders, as showed in the case of Barcelona.

The comparison among the conceptual models applied to each of the cities has led to the development of common guidelines. As the case studies are considered to be representative of the identified Smart City clusters, the guidelines proposed are supposed to be useful for Smart City development of the European Region. However, each city has its own characteristics and its own will. These guidelines should be revised and adapted when used in new cities.

The general ideas extracted for Smart Cities in the European Region are linked to the idea of balance. The view of the Smart City as a “multi-stakeholder, municipally-based partnership”, proposed by the report “Mapping Smart Cities in the EU” (Manville et al., 2014), is confirmed in the interviews to stakeholders. Even if leaded by political stakeholders, there needs to be a balance among the involved stakeholders groups. The increase of social and economic stakeholders is being linked to deep changes in the way Smart Cities address challenges. The increase of social stakeholders is leading to an increase of the people dimensions, Economic stakeholders are regaining weight in two of the analyzed initiatives but the experience of Barcelona shows that economic issues can be addressed without increasing their share.

Answering to the stakeholders view, there need to be a balanced answer to urban challenges. However they have different views of which of the dimensions are more important in the Smart Cities. There is a general consensus among agents in cities about the importance of governance, even if when analyzed by groups the opinion of economic stakeholders slightly differs. This research identifies the importance of the focus on governance but emphasizes the need of a real change in the governance models, according to stakeholders. The switch of focus from environment to people and economy has been identified in two of the analyzed cities. However only in one of them this change was supported by interviewed agents. In the two cities the efforts of the Smart City strategy in environment and mobility have been reduced. This study suggests the need of reconnecting the Smart City initiatives with the environmental aspects to provide a balanced answer to urban challenges. For this purpose, a strong leadership of the Smart City is also needed in combination with the bottom-up approaches.

7.4. Hypothesis validation.

As explained in the previous sections (7.1., 7.2. and 7.3.) the objectives of this research have been fulfilled. The conclusions explained confirm the hypothesis proposed in the first chapter.

Smart City strategies are not being able to materialize the discourses and visions of the different stakeholders involved.

According to this study, Smart City strategies are not being able to completely materialize the discourses of stakeholders, but in certain cases the implementation evolves to become closer to their visions. We will analyze this in detail using the three elements proposed at the beginning of this research: (a) the importance of governance and stakeholders, (b) the integration of dimensions linked to the projects and initiatives implemented, and (c) the connection of these elements with the cities' challenges.

Firstly, when looking at the importance of governance and stakeholders, the research shows that cities are mainly evolving in the direction of the stakeholders' discourses. Governance has slightly gained weight in Vienna, decreased in Milan and kept its key role in Barcelona. However, what is being key in the development of Smart cities is the change in governance models. Barcelona is leading this change from a top-down to a bottom-up model. When we look closer to the balance among the different stakeholders, we see that according to interviewed stakeholders in the city, political stakeholders are the main group in the Smart City. This is coincident with the reality of the surveyed Smart Cities before and now, with the exception of the last developments of Milan. The need of increasing the involvement of civil society is also present in stakeholder's discourses and is also taking place. Though, in the analyzed initiatives a big increase is necessary for this change to better address problems like social polarization. The share of economic stakeholders the second in importance and they are also increasing their share in two of the cities. However, this

is not necessary to increase projects addressing economic instability. Knowledge stakeholders will need to make an effort to maintain their role in the Smart city.

In a second place, dimensions in which the Smart City projects are developed, the opinion of the stakeholders is not materialized in most of the cases. In Vienna, it is being a problem to transmit the importance of the environment dimension. Milan is the city that presents a higher correlation between stakeholders' opinions and the evolution of the initiative. And the change of vision from the Barcelona Smart initiative to Barcelona Digital is not being shared by interviewed experts. In fact, the Smart City initiative from Barcelona was the exception to this lack of correspondence, as both experts and the initiative had a balanced view among dimensions. As explained in the previous paragraph, governance is the dimension that presents a higher coincidence between implementation and stakeholders view.

Thirdly, the challenges Smart Cities are facing are not coincident with the values provided by surveyed stakeholders. They provide a balanced weight among the different challenges, all of them considered to be quite important. However, the Smart City initiatives tend to reproduce in the challenges they address the un-balanced structure of projects and dimensions explained in the previous paragraph. Therefore the results are not coincident. The exception, as explained before, is the Barcelona Smart City initiative, which was providing a balanced answer to urban challenges.

Therefore, only in one of the three analyzed aspects is materializing the vision of stakeholders.

Another key topic in the discussion of results is the balance in the different issues: stakeholders, project dimensions and challenges. There seems to be a correlation between the increase of balance among stakeholders and a growing balance on challenges addressed, but not with an increasing balance on projects dimensions. There is an important difference between the stakeholders' unbalanced vision of the implementation of the Smart City and their balanced view of challenges facing cities. When looking at the methodology, it is key to highlight that stakeholders opinion in these two topics has been extracted with two different methods: text analysis of their provided definitions (for dimensions) and a survey where stakeholders had to evaluate challenges importance from 1 to 5. This sets some doubts about the adequateness of the methodology: do Smart City definitions really matter? Another aspect to highlight is that, when analyzing the opinions of stakeholders separated by groups (political, economic, knowledge and social) the visions of political and knowledge seems to be more balanced and to fit better with the idea of balance. Balance has been taken as the right answer to Smart Cities, but there might be a need for Smart City initiatives to emphasize certain areas in order to reach stakeholders. It is important to understand what do really stakeholders expect from the Smart City, as according to

the definitions analysis, they don't expect them to be the global answer to all urban challenges. **Balanced strategies are not coincident with stakeholders concerns and are not necessarily more efficient at addressing urban problems. Going in the direction of stakeholders opinions can maximize efficiency.**

As a result of the contradictions appearing in this research, the question of the importance of stakeholders' opinion as the only driver of strategies arises. In some aspects, like in achieving more balanced shares of stakeholders groups involved, in increasing the share of civil society, increasing projects in people or in addressing climate change, their opinion is leading to new solutions to urban challenges. But their view also presents contradictions, like the great importance provided to climate change while proposing the reduction of environment and mobility projects, or the lack of importance given to technological drivers in the present moment of transformation. These contradiction point out the need of new ways to approach these subjects tha might not be solved only through bottom-up approaches.

As a conclusion, the materialization of the opinion of stakeholders is not a guarantee for the success of Smart Cities. The combination of bottom-up and top-down governance approaches is necessary to address both short and long-term challenges

The key issues for the success of the Smart City seem to be, accordint to this research:

- a bigger balance among stakeholders thourgh governance models that combine bottom-up and top-down approaches, providing answers to long and short-terms problems.**
- a balanced answer to urban challenges through complex and integrative strategies, specific for each city, that could be more or less balanced depending on the views of stakeholders.**

And as a consequence of the stakeholders, two more questions arise:

How could this be analyzed and measured?

The answer to this question given by this research have been the conceptual model and the developed methodology for its application.

How could cities in the European Region improve their strategies providing an answer to the visions of stakeholders that increase their involvement?

This question has been answered by the elaboration of guidelines for the development of the initiatives in the analyzed cities and in cities in the European Region.

As a conclusion, it can be said that the research provided answers to all the questions posed at the beginning of this dissertation. These answers are complex and lead to new questions that can be answered in future researches.

7.5. The third wave of the Smart City: is it the end?

New conclusions on the development of the Smart Cities can be extracted from the analysis: we are living a new era of the Smart city. I propose the distinction of three stages in the Smart City development in Europe:

Figure 64: Modification of the conceptual model for representing the first wave of the Smart City. Source: author's elaboration.

- ICT, mobility and energy.** A first stage where energy, mobility and ICT were the main elements of the Smart city and policies and financing, as well as industry efforts, were directed to these three elements (Fig. 64). This was synthesized in the first public draft of the operational plan of implementation for the European consortium for innovation in Smart Cities ("European Innovation Partnership on Smart Cities and Communities") that clearly distinguished these 3 fields of action: energy, mobility and ICTs (EIP-SCC, 2013a). ICT was a dimension by itself and not a transversal element. Cities were already developing their projects in these fields in a process usually guided by technology suppliers and telecommunication operators. These areas, and the development of specific technologies for their transformation in an urban context (like sensors, IoT, Big data, etc.) were also the departure point for new technological medium and small companies. The economic interests around the smart city have been a source of criticism to the term, which has been seen as a marketing label. However, this operational plan was arriving at the end of the first era of the Smart Cities and soon new policies in the field that reflect the complexity of the term were needed.

Figure 65: Modification of the conceptual model for representing the second wave of the Smart City. Source: author's elaboration.

- Holistic approach (Fig. 65):** Just one year after the mentioned document, in 2014, the report “Mapping Smart Cities in the UE” was reflecting that the reality of European projects in cities was much more complex than this initiative (Manville et al., 2014). It used the classification proposed by Giffinger et al. (2007) (and used in this research: governance, economy, environment, mobility, people and living), to analyze the European projects developed in 20 European cities (among the initial 468 cities included in the study) according to the horizon 2020 objectives. Technology in this stage is not a dimension anymore, but it is a transversal subsystem articulating the dimensions of the Smart City. It is not the main issue, but an enabler. However, cities did not have a complete set of articulated projects from one day to another. Cities started to recall all the projects they were already developing that had a technological component. They did this in order to coordinate them and develop an extensive and multidisciplinary Smart City strategy taking as a departure point those existing projects. Behind these proposals underlie the idea of the Smart city as a tool to reach a higher efficiency in the city in a holistic approach. In this stage, technology is not anymore a dimension but a subsystem that articulates the different dimensions. As explained in chapter 1 and chapter 3, multiple authors were supporting and analyzing this vision in their researches. From the point of view of governance it was also the moment when cities tried to regain control of all the projects that were developed under the initiative of technology suppliers to put efforts in the direction of the municipal strategy. Some cities reached success and some others did not.

Figure 66: Modification of the conceptual model for representing the third wave of the Smart City. Source: author's elaboration.

- Technology governance and social innovation:** In the intent of a leading role in the technological projects developed in cities, some cities are changing their Smart city strategies (Fig. 66). Other of the drivers of this change is the economic crisis and its effects: the (supposed, and permanently under discussion) potential of social innovation and economy with a human and social basis to drive a change that increases the resilience and competitiveness of urban economies. The third driver that critics of the Smart city mention is the danger of Smart Cities and technology implementation to increase social polarization. The combination of political, technological and economic empowerment of citizenship is seen as a solution to these problems. Two of the analyzed cities (Milan and Barcelona) are redirecting their Smart City strategies to this direction. Another of the common characteristics of the analyzed cities is the reduction of the number of initiatives increasing their complexity. Barcelona has even changed the name of the strategy to “Digital strategy”, a name that recalls the beginning of urban technologies at the end of the nineties (Ajuntament de Barcelona, 2017). The connotations of the term does not make it attractive anymore to represent the urban policies of the new local government. Vienna, that has presented a strong political leadership since the beginning did not need to make that change and reached a holistic and balanced strategy. Technologie keeps on evolving a offering new possibilities, and in this wave the new opportunities and challenges of sharing economy and the new push to projects on social innovation and the new possibilities of new technologies for citizen participation and empowerment were the drivers of the redirection of the Smart City vision.

Could this mean the end of the Smart City? It has been a term that has been polemic since the beginning of its use and it has been used for marketing purposes. As seen in this research, a consensus about its meaning has not been reached and this has led to multiple interpretations. And, as showed in this research, the transition from the definition to the implementation has been a critic step and not all of the interpretations have reached materialization. Some of the interpretations have been leaded by marketing purposes and economic stakeholders have been core in the Smart city initiatives of some of the cities. But this study reflects that the change is not easy and cities with a strong involvement of economic stakeholders in their initiatives are maintaining it in the strategies evolution. This does not need to be the end of the Smart city but could be the end of the smart City driven by economic purposes.

Figure 67: Use the conceptual model for representing a possible future development of the Smart City.
Source: author's elaboration.

New models should be developed to represent this new model of urban technology, but our model constitutes a departure point. In this last step, the conceptual model is used to represent a possible future for the Smart Cities (Fig. 67). Since the second wave of the Smart City, technology is already embedded in the urban management as ICT is pervasive and accessible. However, technology is always evolving and new challenges related to the inclusion of new technological advances in cities. These advances are sometimes drivers of important changes in the socio-economic and spatial structure and distribution of the cities, like in the case of the sharing economy and will always need a coordinated answer from municipality and the different stakeholders. And these answers will conform the future Smart City strategies, even if their name

can change. Smartness is already embedded in the system (even if some further steps are necessary and some municipalities need to make a big effort) but technological advances will always pose new social, economic and spatial challenges, as well as facilitate new solutions for old and new problems.

Governance is the field where more changes will take place. If present trends continue, citizen involvement will increase gradually, leading to a governance structure that will be able to achieve a better combination of bottom-up and top-down decision making. Technology can be a facilitator for this, but emphasis should be made in the relationship among the physical and the digital world. Participation should include the physical presence of stakeholders (including also people with reduced access to technology) and specific training among them. Engagement of citizenship in the provision of data is also a great challenge for cities, and it will be necessary to overcome the increasing privacy concerns. The share of political stakeholders will continue to be reduced as social agents increase their importance. They will assume the role of coordinators and warrantors. Social stakeholders will increase their presence. Economic stakeholders will increase their diversity, including companies based on social innovation, SME's and a new generation of start-ups focused at participating in PPPs (Public private partnership) and PPPPs (public private People partnerships). Big corporation will adapt to this new ecosystem offering cutting-edge technologies in the urban services field. Knowledge stakeholders inclusion will depend on their ability to collaborate and take profit of new economic trends and new governance structures. New city strategies will need to include new governance projects to support and manage these changes.

Climate change and resilience are important but unspecific trends for agents, but the real challenge is to connect the general trends to the need to address specific problems like pollution (with traffic and heating systems as a source), traffic jams or lack of green areas in certain districts. Municipalities tend to build short term strategies (4-8 years) to direct problems and even if problems like climate change seems to be very important to interviewed stakeholders, they did not rate the smaller challenges under the global trend among the more important. If the economic return is not clear, it is very difficult that cities implement important solutions like blue and green infrastructures. As a result, environmental challenges will be addressed through integrated strategies and plans to solve specific problems more than through specific smaller projects in one area. New solutions for building and districts renovation will be necessary, including innovations in heating reducing pollution. One of the main drivers for environmental improvements in the city will be mobility, through further development of electric cars, sharing platforms and MAAS (mobility as a service). Therefore, urban strategies will need to include and recognize the role of mobility and re-include it in the future smart strategies.

Finally, social polarization will be an increasing problem in cities. Local governments will need to make a strong effort to foster social inclusion. Projects focused at fostering human and social capital will need to be increased. Furthermore, the provision of urban services will become a problem and bottom-up solutions will appear. Collective provision of services based on a revision of the sharing economy, as is already happening with private cars or tourist accommodation, will reach other fields. The challenge of governments and of municipalities will be to become leaders of this change, and to produce regulations that avoid negative externalities of the process (like loss of quality of jobs or spatial exclusion). Efforts in increasing social and human capital will also need innovative approaches, and therefore social innovation will be key. This aspects are tightly related to urban economic aspects. Economic re-distribution will be a key challenge, as well as producing economic opportunities to a still broad un-skilled base while providing training opportunities (digital divide is still an important challenge). Social innovation will provide also economic alternatives. The creation of different categories of innovation ecosystems and the combination of specialization with diversification will help the achievement of economic resilience. New business models will appear for new and old companies, which will have to adapt themselves to a new urban socio-economic future.

The Smart City of the future should be a system that faces and takes benefit of new technological challenges to foster human and social capital and achieve economic and environmental resilience. It will provide efficient and sustainable new solutions to urban problems to reach equality and quality of life taking on the basis of a multi-stakeholder, municipally-led and socially-based partnership.

7.6. Possible uses of the model

As the proposed conceptual model has not the limited purpose to serve to this research, it has been considered necessary to develop a synthesis of its possible uses. This list aims to help other researchers and stakeholders for future use of this conceptual model and this research.

As a summary, this research has proved the use of the model for:

1. Represent the complex reality of the Smart Cities enhancing its individual understanding. It allowed the representation of the interrelated elements that conform the Smart City (stakeholders, projects and challenges) to ease its understanding.
2. Display real implementation of specific Smart City strategies of different cities. This representation has been made for present, past and future stages. It has allowed the comparison among the different stages.
3. Serve as a basis for the discussion with different stakeholders about their vision of either the Smart City and the specific strategy of their city.
4. Representation of the opinion of different stakeholders about the Smart City as defined by the conceptual model
5. Allow comparison among cities that have different strategies.
6. Allow comparison among the real implementation of the cities and the
7. Developing guidelines for Smart City strategies of cities and for cities in a specific region: the European Region or the Mediterranean Region (See annex 5).

Furthermore, there are other possible uses of the conceptual model, both for other researchers and for the different stakeholders. Some of them have been suggested by interviewed stakeholders.

1. Communication and dissemination of the Smart City strategy of a city. The conceptual model, if correctly explained, can support the communication of the strategy.
2. Design of the Strategy. Analysis of the existing projects focused on technology in the city. Design of a new strategy or modification of the existing strategy using the model as a tool.
3. Participatory processes. The conceptual model has proved its usefulness for discussion with individuals. It can also be used with groups and serve as a basis for different participatory processes: discussion with experts (focus groups, see annex 5), with citizens, etc.
4. Analysis of commercial strategy. The conceptual model can help companies to identify their position regarding urban strategies.
5. Marketing strategy. The conceptual model can help companies to define new commercial and marketing strategies, identifying new gaps to be filled with new products.
6. Training. The model can support training in municipalities and public companies, helping the communication of the strategy and fostering the understanding of the final goals of their work.

7. Assessment. The conceptual model and the developed methodology can serve as a basis for the development of a complete assessment methodologies for different purposes: commercial, governmental, etc.
8. Future scenarios. The model can help the development of possible future scenarios for the Smart City.

Finally, the conceptual model becomes the departure point for future research.

7.7. Future research

The presented research leads to the formulation of new questions that can be the departure point of future knowledge development.

Regarding the conceptual model, it can increase its effectiveness to support dialogue among stakeholders. For this, it must be developed with differing levels of complexity to reach other groups. For technology experts it should include new dimensions focused on technological tools. For research, it can be taken as a starting point for developing further layers of complexity. Finally, for civil society groups, it must be simplified for easy communication with the public.

We should emphasize that the conclusions of this research must be supported by analytical-statistical data for decision-making. Future research should concentrate on systematizing the connection between the conceptual model and data analysis to enable its widespread use. Text analysis software will be programmed based on the text analysis code in this research and used as a supportive tool. The research also suggests the possibility of applying quantitative indicators for a deeper analysis of the impacts and perceived impacts of Smart City initiatives. The model has been structured to allow it to be connected with various current assessment methodologies that use a similar structure of dimensions or clusters (Giffinger et al., 2007; Monzon, 2015). Systematization and connection to statistical data will allow the development of comparative case studies of cities with a Smart City strategy.

As a result of the conclusions of this research, a new research on the topic appears: the Smart City and its switch to technology governance and social innovation. The cases of Barcelona and Milan clearly reflect this trend. However, it must be proved in the initiatives in other cities. New instruments need to be developed for the conceptualization and assessment of this new conception. However, the proposed tools can be used as a departure point.

Finally, the proposed research model can be used for research in other topics, and not only the Smart City. This is due to its ability to connect stakeholder's involvement and urban challenges, an approach that can be used in different fields of urban research.

7.7. Scientific results

The relevance of this research has been proved thorough the publications of parts of it in conferences and scientific journals:

Publications:

- Smart City Projects Assessment Matrix: Connecting Challenges and Actions in the Mediterranean Region. FERNANDEZ-ANEZ, Victoria; VELAZQUEZ, Guillermo; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. 2018. Journal of Urban Technology.
- Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf. (2017). Cities. <https://doi.org/10.1016/J.CITIES.2017.12.004> (Published online). For the printed version: Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf. (2017). Cities, 78. 4-16.
- Incorporating a Systemic and Foresight Approach into Smart City Initiatives: The Case of Spanish Cities. FERNÁNDEZ-GÜELL, J.-M., COLLADO-LARA, M., GUZMÁN-ARAÑA, S., & FERNÁNDEZ-AÑEZ, V. (2016). Journal of Urban Technology, 1–25.
- Stakeholders approach to smart cities: a survey on smart city definitions. FERNANDEZ-ANEZ, Victoria. (2016) First International Conference, Smart-CT 2016, Málaga, Spain, June 15-17, 2016, Proceedings, Lecture notes in Computer Sciences, 9704 pp. 157-167, 2016.
- How to incorporate urban complexity, diversity and intelligence into smart cities initiatives FERNÁNDEZ GÜELL, José Miguel; GUZMÁN ARAÑA, Silvia; COLLADO LARA, Marta; FERNANDEZ-ANEZ, Victoria. (2016) First International Conference, Smart-CT 2016, Málaga, Spain, June 15-17, 2016, Proceedings, Lecture notes in Computer Sciences, 9704 pp. 85-94, 2016.
- Movilidad inteligente. PÉREZ PRADA, Fiamma; VELÁZQUEZ ROMERA, Guillermo; FERNÁNDEZ AÑEZ, Victoria; DORAO SÁNCHEZ, Javier. (2015). Economía Industrial, 395, 17-28.

Conferences:

- Ciudad inteligente y visión integrada: Barcelona, Milán y Viena. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf, POLETTI, Angela. (2018). Libro de Comunicaciones. IV Congreso Ciudades inteligentes. Madrid, 30-31 de Mayo 2018. Publicación
- Procesos de gobernanza en proyectos de Ciudad Inteligente en un contexto internacional. Metodología de Análisis. FERNANDEZ-ANEZ, Victoria; MONZÓN DE CÁCERES, Andrés; VELAZQUEZ;

Guillermo; RAMIREZ, María. (2016). Libro de Comunicaciones. II Congreso Ciudades inteligentes. Madrid, 13-14 Abril de 2016. Publicación

- Addressing urban challenges: Smart City assessment within a Regional context. FERNANDEZ-ANEZ, Victoria; VELAZQUEZ; Guillermo; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. En: 56th ERSAC Congress Cities & Regions: Smart, Sustainable, Inclusive? 23-26 August 2016, Vienna, Austria.
- Smart city assessment methodologies: an opportunity for more sustainable cities. FERNANDEZ-ANEZ, Victoria. En: 56th ERSAC Congress Cities & Regions: Smart, Sustainable, Inclusive? 23-26 August 2016, Vienna, Austria.
- Stakeholders approach to smart cities: a survey on smart city definitions. FERNANDEZ-ANEZ, Victoria. (2016) Smart CT, Málaga 14-15th June 2016
- How to incorporate urban complexity, diversity and intelligence into smart cities initiatives FERNÁNDEZ GÜELL, José Miguel; FERNANDEZ-ANEZ, Victoria; GUZMÁN ARAÑA, Silvia; COLLADO LARA, Marta. (2016) Smart CT, Málaga 14-15th June 2016
- Smart City Assessment: a holistic approach to urban diversity. FERNANDEZ-ANEZ, Victoria. (2015) Vienna Young Scientists Symposium. 9-10th June 2016
- Proyectos inteligentes y Gobernanza en la región Mediterránea. VELAZQUEZ; Guillermo; FERNANDEZ-ANEZ, Victoria; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. (2016). Libro de Comunicaciones. II Congreso Ciudades inteligentes. Madrid, 13-14 Abril de 2016.
- Smart Cities Definition: discourses and Stakeholders. FERNANDEZ-ANEZ, Victoria. (2015). International Conference on City Sciences. Tongji University. June 2015 – Shanghai. Ponencia.
- Buenas Prácticas en Ciudades Inteligentes: Respondiendo a los retos urbanos FERNÁNDEZ ÁÑEZ, Victoria; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés; TORREGROSA SANTANA, Andrea (2015). Libro de Comunicaciones. I Congreso Ciudades inteligentes. Madrid, 24-25 de Marzo de 2015.

REFERENCES

- Ajuntament de Barcelona. (n.d.). Barcelona Smart City. Retrieved April 15, 2015, from <http://smartcity.bcn.cat/>.
- Ajuntament de Barcelona. (2013). The vision, focus and projects of the City of Barcelona in the context of Smart Cities. In *City next conference* (p. 58). Helsinki. Retrieved from <https://www.slideshare.net/MicrosoftSuomi/city-next-smartbarcelona-28102013>
- Ajuntament de Barcelona. (2016). *Pla Barcelona Ciutat Digital*. Barcelona. Retrieved from https://ajuntament.barcelona.cat/digital/sites/default/files/pla_ciutat_digital_mdgovern.pdf
- Ajuntament de Barcelona. (2017). Barcelona Ciudad Digital | Barcelona Ciudad Digital. Retrieved January 7, 2019, from <https://ajuntament.barcelona.cat/digital/es>
- Alawadhi, S., Aldama-Nalda, A., Chourabi, H., Gil-Garcia, J. R., Leung, S., Mellouli, S., ... Walker, S. (2012). Building understanding of smart city initiatives. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 7443 LNCS, pp. 40–53). https://doi.org/10.1007/978-3-642-33489-4_4
- AlAwadhi, S., & Scholl, H. J. (Jochen). (2013a). Aspirations and Realizations: The Smart City of Seattle. In *2013 46th Hawaii International Conference on System Sciences* (pp. 1695–1703). IEEE. <https://doi.org/10.1109/HICSS.2013.102>
- AlAwadhi, S., & Scholl, H. J. (Jochen). (2013b). Aspirations and Realizations: The Smart City of Seattle. In *2013 46th Hawaii International Conference on System Sciences* (pp. 1695–1703). IEEE. <https://doi.org/10.1109/HICSS.2013.102>
- 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>
- Alcaldía de Medellín. (n.d.). Medellín Ciudad Inteligente. Retrieved March 16, 2016, from <http://www.mdeinteligente.co/>
- Amsterdam City. (n.d.). Amsterdam Smart City. Retrieved April 15, 2015, from <https://amsterdamsmartcity.com/>
- Angelidou, M. (2014). Smart city policies: A spatial approach. *Cities*, 41, S3–S11. <https://doi.org/10.1016/j.cities.2014.06.007>
- Anthopoulos, L. G., & Vakali, A. (2012). Urban Planning and Smart Cities: Interrelations and Reciprocities. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 7281, 178–189. <https://doi.org/10.1007/978-3-642-30241-1>
- Anthopoulos, L., Janssen, M., & Weerakkody, V. (2015). Comparing Smart Cities with Different Modeling Approaches. *The International World Wide Web Conference Committee (IW3C2)*, 1997, 525–528. <https://doi.org/10.1145/2740908.2743911>
- Ayuntamiento de Barcelona. (2014). *Barcelona Smart City*.
- Ayuntamiento de Zaragoza. (n.d.). Estrategia de Gobierno Abierto Ciudad Digital 2012–2015. Retrieved March 16, 2016, from <http://www.zaragoza.es/ciudad/sectores/tecnologia/tecno/ciudad-inteligente.htm>.
- Bakıcı, T., Almirall, E., Wareham, J., Bakıcı, T., Almirall, E., & Wareham, J. (2013). A Smart City Initiative: the Case of Barcelona. *J Knowl Econ*, 4, 135–148. <https://doi.org/10.1007/s13132-012-0084-9>
- Barsalou, L. W. (2005). Continuity of the conceptual system across species. *Trends in Cognitive Sciences*. <https://doi.org/10.1016/j.tics.2005.05.003>

- Batagan, L. (2011). Indicators for Economic and Social Development of Future Smart City. *Journal of Applied Quantitative Methods*, 6(3), 27–34. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=91526422&lang=es&site=ehost-live&scope=site>
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... Portugali, Y. (2012a). Smart cities of the future. *European Physical Journal: Special Topics*, 214(1), 481–518. <https://doi.org/10.1140/epjst/e2012-01703-3>
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... Portugali, Y. (2012b). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481–518. <https://doi.org/10.1140/epjst/e2012-01703-3>
- 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>
- British Standards Institution. (2014). Smart city framework – Guide to establishing strategies for smart cities and communities – Executive Summary, 11.
- Brown, H. I. (2006). *Conceptual systems*. *Conceptual Systems*. <https://doi.org/10.4324/9780203967904>
- Callejo Gallego, J., Del Val Cid, C., Gutierrez Brito, J., & Viedma Rojas, A. (2009). *Introducción a las técnicas de investigación social*. Madrid: Editorial Centro de Estudios Ramón Areces, S.A.
- Capdevila, I., & Zarlenga, M. I. (2015). Smart City or Smart Citizens? The Barcelona Case. *Journal of Strategy and Management*, (AUGUST), 1–16. <https://doi.org/10.2139/ssrn.2585682>
- Caragliu, A., Bo, C. D. E. L., & Nijkamp, P. (2009). Smart cities in Europe. *3rd Central European Conference in Regional Science – CERS*, 45–59.
- Caragliu, A., & Del Bo, C. (2012). Smartness and European urban performance: assessing the local impacts of smart urban attributes. *Innovation: The European Journal of Social Science Research*, 25(2), 97–113. <https://doi.org/10.1080/13511610.2012.660323>
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart Cities in Europe. *Journal of Urban Technology*, 18(2), 65–82. <https://doi.org/10.1080/10630732.2011.601117>
- Castells, M. (2004). Space of Flows, Space of Places: Materials for a Theory of Urbanism in the Information Age. *The Cybercities Reader*, 82–93. <https://doi.org/10.4324/9780203826508>
- Castelnovo, W., Misuraca, G., & Savoldelli, A. (2015). Smart Cities Governance: The Need for a Holistic Approach to Assessing Urban Participatory Policy Making. *Social Science Computer Review*, 0894439315611103-. <https://doi.org/10.1177/0894439315611103>
- Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., ... Scholl, H. J. (2012). Understanding Smart Cities: An Integrative Framework. In *2012 45th Hawaii International Conference on System Sciences* (pp. 2289–2297). IEEE. <https://doi.org/10.1109/HICSS.2012.615>
- CISCO. (n.d.). Smart + connected communities. Retrieved March 21, 2016, from <http://www.cisco.com>
- City of Boston. (n.d.). Digital Strategy. Retrieved March 16, 2016, from <http://www.cityofboston.gov/DoIT/strategy/>
- City of Vienna. (2014). *Smart City Wien Framework Strategy*. Vienna City Administration. Retrieved from <https://smartcity.wien.gv.at/site/en/projekte/verkehr-stadtentwicklung/smile-die-mobilitatsplattform-der-zukunft-2/>
- City of Vienna. (2016). Smart City Wien Projects. Retrieved June 2, 2016, from <https://smartcity.wien.gv.at/site/en/projekte/>
- Claire Taylor. (2018). Europe aims to have 300 smart cities by end of next year - EnergyPost.eu. Retrieved December 4, 2018, from <https://energypost.eu/europe-aims-to-have-300-smart-cities-next-year/>
- Cohen, B. (2014). Smart City Index Master Indicators. *Smart Cities Council*. Smart City Council. Retrieved from <http://smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey>

- Colldahl, C., Frey, S., & Kelemen, J. E. (2013). Smart Cities : Strategic Sustainable Development for an Urban World, 63. Retrieved from <https://www.diva-portal.org/smash/get/diva2:832150/FULLTEXT01.pdf>
- Comune di Milano. (n.d.). Milano Smart City. Retrieved January 7, 2019, from <http://www.milanosmartcity.org/joomla/>
- Comune di Milano. (2013a). *Guidelines Milano Smart City*. Milan. Retrieved from [http://www.milanosmartcity.org/joomla/images/sampled/programma/SmartCity/milano smart city - guidelines.pdf](http://www.milanosmartcity.org/joomla/images/sampled/programma/SmartCity/milano_smart_city_-_guidelines.pdf)
- Comune di Milano. (2013b). *Milano Smart City. Progetti e principali interventi*. Milan. Retrieved from www.milanosmartcity.org
- Correia, L. M., & Wüstel, K. (2011). Smart Cities Applications and Requirements White Paper. Retrieved November 26, 2014, from http://www.networks-etp.eu/fileadmin/user_upload/Publications/Position_White_Papers/White_Paper_Smart_Cities_Applications.pdf
- Dameri, R. P. (2013, October 22). Searching for Smart City definition: a comprehensive proposal. *INTERNATIONAL JOURNAL OF COMPUTERS & TECHNOLOGY*. Retrieved from <http://cirworld.com/journals/index.php/ijct/article/view/2514>
- Dameri, R. P., Negre, E., & Rosenthal-Sabroux, C. (2016). Triple Helix in smart cities: A literature review about the vision of public bodies, universities, and private companies. In *Proceedings of the Annual Hawaii International Conference on System Sciences*. <https://doi.org/10.1109/HICSS.2016.372>
- De Santis, R., Fasano, A., Mignolli, N., & Villa, A. (2014, March 1). Smart city: fact and fiction. Retrieved from http://mpa.ub.uni-muenchen.de/54536/1/MPRA_paper_54536.pdf
- Deakin, M. (2011). The embedded intelligence of smart cities. *Intelligent Buildings International*, 3(3), 189–197. <https://doi.org/10.1080/17508975.2011.579340>
- Deakin, M. (2014). Smart cities: the state-of-the-art and governance challenge. *Triple Helix*, 1(1), 7. <https://doi.org/10.1186/s40604-014-0007-9>
- EIP-SCC. (2013a). *European Innovation Partnership on Smart Cities and Communities Operational Implementation Plan: First Public Draft*. Retrieved from <https://www.smartcities.at/assets/Uploads/operational-implementation-plan-oip-v2-en.pdf>
- EIP-SCC. (2013b). *European Innovation Partnership on Smart Cities and Communities Strategic Implementation Plan*. Retrieved from <http://www.eu-smartcities.eu/>
- EIP-SCC. (2016). *The Marketplace of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) How the Marketplace team can help you launch Smart City solutions*. Retrieved from <https://eu-smartcities.eu/sites/default/files/2018-04/EIPSCC-Brochure.pdf>
- EIP-SCC, & European Commission. (2016). *Marketplace of the European Innovation Partnership On Smart Cities and Communities A Consultation Paper to Stimulate Action TOWARDS A JOINT INVESTMENT PROGRAMME FOR EUROPEAN SMART CITIES*. Retrieved from https://eu-smartcities.eu/sites/default/files/2018-07/EIP-SCC_Towards a Joint Investment_v14.pdf
- Erenel, Z., & Altınçay, H. (2012). Nonlinear transformation of term frequencies for term weighting in text categorization. *Engineering Applications of Artificial Intelligence*, 25(7), 1505–1514. <https://doi.org/10.1016/J.ENGAPPAI.2012.06.013>
- Etzkowitz, H., & Zhou, C. (2006). Triple Helix twins: innovation and sustainability. *Science and Public Policy*, 33(1), 77–83. <https://doi.org/10.3152/147154306781779154>
- European Commission. (n.d.). Smart cities. Retrieved December 4, 2018, from https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en
- European Commission. (2010). *COMMUNICATION FROM THE COMMISSION. EUROPE 2020 A strategy for smart, sustainable and inclusive growth*. Brussels. Retrieved from [http://ec.europa.eu/eu2020/pdf/COMPLET EN BARROSO 007 - Europe 2020 - EN version.pdf](http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%2007%20-%20Europe%2020%20-%20EN%20version.pdf)

- European Commission. (2011a). *Cities of tomorrow - Challenges, visions, ways forward. Information Society Policy Link*. Publicatios Office of the European Union. <https://doi.org/10.2776/41803>
- European Commission. (2011b). *Europe 2020 Flagship Initiative Innovation Union*. Luxembourg. Retrieved from https://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication-brochure_en.pdf
- European Commission. (2012). *C(2012) 4701 final COMMUNICATION FROM THE COMMISSION SMART CITIES AND COMMUNITIES - EUROPEAN INNOVATION PARTNERSHIP*. Brussels. Retrieved from <http://ec.europa.eu/transparency/regdoc/rep/3/2012/EN/3-2012-4701-EN-F1-1.PDF>
- Fernandez-Anez, V. (2016). Stakeholders Approach to Smart Cities: A Survey on Smart City Definitions. *Lecture Notes in Computer Science*, 9704, 157–167. https://doi.org/10.1007/978-3-319-39595-1_16
- Fernandez-Anez, V., Fernández-Güell, J. M., & Giffinger, R. (2017). Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. *Cities*, 1–12. <https://doi.org/10.1016/J.CITIES.2017.12.004>
- Fernandez-Anez, V., Velazquez, G., Perez-Prada, F., & Monzón, A. (2018). Smart City Projects Assessment Matrix: Connecting Challenges and Actions in the Mediterranean Region. *Journal of Urban Technology*, 1–25. <https://doi.org/10.1080/10630732.2018.1498706>
- Fernández-Güell, J.-M., Collado-Lara, M., Guzmán-Araña, S., & Fernández-Añez, V. (2016). Incorporating a Systemic and Foresight Approach into Smart City Initiatives: The Case of Spanish Cities. *Journal of Urban Technology*, 1–25. <https://doi.org/10.1080/10630732.2016.1164441>
- Fernandez, M. (2015). *La Smart City Como Imaginario*.
- GE-Allstom. (n.d.). Smart Cities. Retrieved April 4, 2016, from <http://www.gegridsolutions.com>
- Giffinger, R. , & Lü, H. (2015). *The Smart City perspective: A necessary change from technical to urban innovation* (First). Milano: Fondazione Giangiacomo Feltrinelli.
- Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). *Smart cities Ranking of European medium-sized cities*. Vienna. Retrieved from http://www.smart-cities.eu/download/smart_cities_final_report.pdf
- Grimaldi, D., & Fernandez, V. (2017). The alignment of University curricula with the building of a Smart City: A case study from Barcelona. *Technological Forecasting and Social Change*, 123. <https://doi.org/10.1016/j.techfore.2016.03.011>
- Hall, R. E., Braverman, J., Taylor, J., & Todosow, H. (2000). The Vision of A Smart City. *2nd International Life Extension Technology Workshop Paris, France September 28,2000*.
- Haque, U. (2012). Surely there's a smarter approach to smart cities? Retrieved July 1, 2013, from <https://www.wired.co.uk/article/potential-of-smarter-cities-beyond-ibm-and-cisco>
- Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for Smarter Cities. <https://doi.org/10.1147/JRD.2010.2048257>
- IBM. (n.d.). Smarter cities. Retrieved March 21, 2016, from http://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/
- Indra. (n.d.). Smart Cities. Retrieved March 22, 2016, from <http://www.indracompany.com/sector/administraciones-publicas/oferta/%0Asmart-cities%0A>
- Infocomm Development Authority of Singapore. (2015). Inteligent Nation 2015. Retrieved March 17, 2016, from <http://www.ida.gov.sg/Tech-Scene-News/iN2015-Masterplan>
- Kummitha, R. K. R., & Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. *Cities*, 67(July 2016), 43–52. <https://doi.org/10.1016/j.cities.2017.04.010>
- Lakoff, G. (1994). What is a Conceptual System. *The Nature and Ontogenesis of Meaning*.
- Lan, M., & Su, J. (2007). *Supervised and Traditional Term Weighting Methods for Automatic Text Categorization*. *JOURNAL OF IEEE PAMI* (Vol. 10). Retrieved from

- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.151.3665&rep=rep1&type=pdf>
- Le Galès, P. (2004). Gouvernance. In L. Boussaguet, S. Jacquot, & P. Ravinet (Eds.), *Dictionnaire des politiques publiques* (pp. 242–250). Paris: Presses de Science.
- Lee, J., & Lee, H. (2014). Developing and validating a citizen-centric typology for smart city services. *Government Information Quarterly*, 31, S93–S105. <https://doi.org/10.1016/j.giq.2014.01.010>
- Leydesdorff, L., & Deakin, M. (2010). The Triple Helix Model and the Meta-Stabilization of Urban Technologies in Smart Cities. *Physics and Society; Adaptation and Self-Organizing Systems*. Retrieved from <http://arxiv.org/abs/1003.3344>
- Lombardi, P., Giordano, S., Caragliu, A., Del Bo, C., Deakin, M., Nijkamp, P., ... Farouh, H. (2011). An Advanced Triple-Helix Network Model for Smart Cities Performance. *Green and Ecological Technologies for Urban Planning*, 59–73. <https://doi.org/10.4018/978-1-61350-453-6.ch004>
- Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research*, 25(2), 137–149. <https://doi.org/10.1080/13511610.2012.660325>
- Man Lan, Chew Lim Tan, Jian Su, & Yue Lu. (2009). Supervised and Traditional Term Weighting Methods for Automatic Text Categorization. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 31(4), 721–735. <https://doi.org/10.1109/TPAMI.2008.110>
- Manchester City Council. (n.d.). Manchester Digital Development Agency.
- Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., ... Kotterink, B. (2014). *Mapping smart cities in the EU. European Parliament: Policy Department, Economic and Scientific Policy*. <https://doi.org/10.1007/s13398-014-0173-7.2>
- March, H., & Ribera-Fumaz, R. (2016). Smart contradictions: The politics of making Barcelona a Self-sufficient city. *European Urban and Regional Studies*, 23(4), 816–830. <https://doi.org/10.1177/0969776414554488>
- Mattoni, B., Gugliermetti, F., & Bisegna, F. (2015). A multilevel method to assess and design the renovation and integration of Smart Cities. *Sustainable Cities and Society*, 15, 105–119. <https://doi.org/10.1016/j.scs.2014.12.002>
- Meijer, A., & Bolivar, M. P. R. (2015). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 0020852314564308-. <https://doi.org/10.1177/0020852314564308>
- Merton, R. K. (2007). On Sociological Theories of the Middle Range [1949]. *Classical Sociological Theory*. https://doi.org/10.1007/3-540-27354-9_1
- Misuraca, G., Ferro, E., & Caroleo, B. (2010). Assessing emerging ICT-enabled governance models in european cities: Results from a mapping survey. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 6228 LNCS, pp. 168–179). https://doi.org/10.1007/978-3-642-14799-9_15
- Mitchell, R. K., Wood, D. J., & Agle, B. (1997). Toward a Theory of Stakeholder Identification and Salience. *Academy of Management Review*, 22(4), 853–886. <https://doi.org/10.5465/AMR.1997.9711022105>
- Monzon, Andres; Fernandez-Anez, Victoria; Velazquez-Romera, Guillermo; Perez-Prada, F. (2017). *ASSESSMENT METHODOLOGY FOR SMART CITY PROJECTS Application to the Mediterranean Region*. Madrid. Retrieved from http://www.eiburs-ascimer.transyt-projects.com/images/files/deliverables/project_summary.pdf
- Monzon, A. (2015). Smart cities concept and challenges: Bases for the assessment of smart city projects. In *Communications in Computer and Information Science* (Vol. 579, pp. 17–31). https://doi.org/10.1007/978-3-319-27753-0_2
- Nam, T., & Pardo, T. A. (2011a). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times - dg.o '11* (p. 282). New York,

- New York, USA: ACM Press. <https://doi.org/10.1145/2037556.2037602>
- Nam, T., & Pardo, T. A. (2011b). Conceptualizing smart city with dimensions of technology, people, and institutions. In *12th Annual International Conference on Digital Government Research* (Vol. 5016 LNCS, pp. 215–264). Retrieved from https://inta-aivn.org/images/cc/Urbanism/backgrounddocuments/dgo_2011_smartcity.pdf
- Nam, T., & Pardo, T. A. (2011c). Smart City as Urban Innovation: Focusing on Management, Policy, and Context: Retrieved February 10, 2015, from http://www.ctg.albany.edu/publications/journals/icegov_2011_smartcity
- Nam, T., & Pardo, T. A. (2011d). Smart city as urban innovation. *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance - ICEGOV '11*, 185. <https://doi.org/10.1145/2072069.2072100>
- Networking Society Lab. (2016). *Ericsson Networked Society Index*. Stockholm, Sweden.
- Nijkamp, P., & Kourtit, K. (2013). The “New Urban Europe”: Global Challenges and Local Responses in the Urban Century. *European Planning Studies*, 21(3), 291–315. <https://doi.org/10.1080/09654313.2012.716243>
- Perez-Prada, F., Fernandez-Anez, V., & Velazquez-Romera, G. (2015). *SMART CITIES: CONCEPT AND CHALLENGES. ASCIMER Project, DELIVERABLE 1A*. Madrid. Retrieved from http://www.eiburs-ascimer.transyt-projects.com/images/files/deliverables/d1a_concept_and_challenges.pdf
- Qu, Y., & Wang, Q. (2014). A Study on the Evaluation Index System of “Smart City.” *International Conference on Economics and Management Engineering (Iceme 2014)*, 110–114.
- Ringnes, I. (2014, June). What are Smart Cities? Retrieved March 15, 2016, from <http://nyintl.net/2014/06/what-are-smart-cities/>
- Ruhlandt, R. W. S. (2018). The governance of smart cities: A systematic literature review. *Cities*, 81, 1–23. <https://doi.org/10.1016/J.CITIES.2018.02.014>
- Russo, F., Rindone, C., & Panuccio, P. (2014). The process of smart city definition at an EU level. In *WIT Transactions on Ecology and the Environment* (Vol. 191, pp. 979–989). WIT Press. <https://doi.org/10.2495/SC140832>
- Salton, G., & Buckley, C. (1988). Term-weighting approaches in automatic text retrieval. *Information Processing & Management*, 24(5), 513–523. [https://doi.org/10.1016/0306-4573\(88\)90021-0](https://doi.org/10.1016/0306-4573(88)90021-0)
- Schweiker, M. (2010). Smart cities. Conseil des Communes et Régions d’Europe-Council of European Municipalities and Regions.
- Siemens. (n.d.). Transforming cities for the better through sustainable technology.
- Telefónica. (n.d.). Smart Cities. Retrieved March 22, 2016, from <https://m2m.telefonica.com/smart-cities/smart-cities>
- The European Commission. (2013). European Innovation Partnership on Smart Cities and Communities: Operational Implementation Plan- First Public Draft. *European Innovation Partnership on Smart Cities and Communities*, 111. Retrieved from http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf
- The Institution of Engineering and Technology. (2016). *Smart Cities. Time to involve the people*. Retrieved from file:///C:/Users/Victoria/Documents/tesis final/SSD1482 IET Smart Cities Brochure-v5.pdf
- The Scottish Government, Scottish Cities Alliance, & Urban Tide. (2014). *Smart Cities Maturity Model and Self-Assessment Tool: Guidance Note for Completion of Self-Assessment Tool*.
- Tomàs, M., & Cegarra, B. (2016). Actores y modelos de gobernanza en las Smart cities Actors and models of governance in Smart Cities, 6(2), 47–62.
- UN-Habitat III. (2016). New Urban Agenda. In *Conference on Housing and Sustainable Urban Development (Habitat III)*. Retrieved from <http://habitat3.org/wp-content/uploads/NUA-English.pdf>

- United Nations. (1996). REPORT OF THE UNITED NATIONS CONFERENCE ON HUMAN SETTLEMENTS (HABITAT II), 02500(June), 3–14. Retrieved from <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G96/025/00/PDF/G9602500.pdf?OpenElement>
- United Nations Economic Commission for Europe (UNECE). (n.d.). United Smart Cities (USC) - United Nations Partnerships for SDGs platform. Retrieved April 3, 2016, from <https://sustainabledevelopment.un.org/partnership/?p=10009>
- Vienna, C. of. (n.d.). Projects – Smart City Wien. Retrieved from <https://smartcity.wien.gv.at/site/en/projects/>

ANNEXES

Annex 1: list of interviewed experts**Prevalidation:**

Leonor Berriochoa, Engineer, Urban division, EIB, Local Government.
 Daniel Sarasa, Innovation Program Manager at Zaragoza's City council;
 Patricia Molina, Integrated Urban Regeneration, Lead Researcher. TECNALIA Research & innovation Sustainable Construction Division
 Samir Awad, Technical Director, B-us
 Enrique Díaz-Plaza, business developer executive in Energy and Smart cities, IBM España
 Cristina Fernández, vocal and activist, Ecologistas en Accion, Madrid
 Rudolf Giffinger, Head of the Centre of Regional Science, Department of Spatial Development, Infrastructure and Environmental Planning, Vienna University of Technology
 María Isla, Co-founder&CMO of @Hackity.
 Ana Peñalver, Innovation projects Director, TECSOS Foundation (Red Cross + Vodafone)

Validation:**Barcelona**

Francesca Bria, Chief Technology and Digital Innovation Office
 Fernando Pindado, Commissioner of Participation and Active Democracy of Barcelona City Hall
 Tinencia de Ecologia, Urbanisme i mobilitat, Team of Janet Sanz, Deputy mayor on Ecology, Urban Planning and mobility
 Pilar Conesa, Founder and CEO, Anteverti, organizers of Smart City Expo World Congress
 Blanca Arellano, associate professor. Co-director of the postgraduate program Smart cities: Urban planning, technology and sustainability. UPC
 Josep Roca, Professor and Director of Centre of Land Policy and appraisals. Co-director of the postgraduate program Smart cities: Urban planning, technology and sustainability. UPC
 Esteve Almirall, Associate professor, Department of Operations, Innovation and Data Sciences, ESADE
 Jordi Roig, Associate professor at Department of Microelectronics and electronic systems, UAB. Mass factory co-director
 Tomas Diez, Director of Fab Lab Barcelona and Fab Lab Academy global coordinator
 Carles Batalla, Customer Solutions Architect, CISCO
 Jorgina Martinez, Manager of Ateneu de Fabricació Les Corts
 Jordi Picas, Innovation Director SUARA cooperative of social services
 Salvador Clarós, President of Poblenou Neighbourhood association
 Juan Campos, Chief Operations Officer at Sensefields
 Rosa Paradell, Smart Cities Innovation Business Unit Manager at i2CAT

Milán

Pierfrancesco Maran, Deputy Mayor Urban Planning, Green spaces and Agriculture

Guido Albertini, Chief Information officer

Valentino Sevino, Mobility Planning Area Director, Environment, Mobility and Territory Agency (AMAT)

Piero Pelizzaro, Project Manager, Department of Economic Innovation, Smart City and University

Eugenio Morello, Assistant professor in Urban design

Grazia Concilio, Associate professor, Department of Architecture and Urban studies, Politecnico di Milano.

Project coordinator Open4citizens.

Alberto Colorni, Director of Poliedra Research Group and Professor at the Department of Industrial Design, Arts, Communication and Fashion, Politecnico di Milano

Fabio Scaragli, Coordinator FGB Learning, Fondazione Giacomo Brodolini,

Damiano di Simine, President, Legambiente Lombardia

Matteo Bartolomeo, Partner at AVANZI

Pierpaolo Palazzoli, Head of A2A Smart City lab

Constantino Bongiorno, Co-founder at WEMAKE

Gabriele Pasqui, Professor and Director of Architecture and Urban Studies Department

Alfonso Fugetta, Chief Executive Officer and Scientific Director of CEFRIEL and Vice President of CEFRIEL USA Inc

Emilia Bossi Moratti, President of Participation popular initiatives and Open Data Commission

Vienna:

Thomas Madreiter, Director of Urban Planning at Vienna City Council

Dominic Weiss, Public Affairs Management of TINA VIENNA Urban Technologies & Strategies GmbH

Tanja Wehsely, Member of Parliament for Vienna and of the Social City Wien Expert Advisory Board;

Christof Schremmer, Expert in urban and regional development and regional economics at the Austrian Institute of Spatial Planning (OIR)

Verena Madner, Research Institute for Urban Management and Governance. Head of Research Institute. Professor at the Vienna University of Economics and Business

Christian Rammel, Research Area Leader, Institute for Ecological Economics. Professor at the Vienna University of Economics and Business.

Hans-Martin Neumann, Senior Research Engineer. Energy Department. Sustainable buildings and cities. Austrian Institute of Technology

Paul Pfaffenbichler, Researcher at the Institute of Transport Science, Vienna Technical University.

Herwig Schreiner, R&D Manager at Siemens AG Austria.

Peter Kuhnberger, Head of Wiengestalten, Dialogplus

Lukas Lang, Project manager Environmental Impact Assessment and transport, Wien 3420

Michaela Stumpf, Member and resident of the car-free district

Thomas Ritt, Economist and head of the municipal policy department at the Vienna Chamber of Labour.

Klemmens Himpele, Head of Department MA23- Economics, Labor and Statistics

Ernst Gebetsroither, Scientist. Energy Department. Sustainable buildings and cities. AIT

Annex 2: Analysis of initiatives: Vienna

A2. 1. Vienna stakeholders' opinions

A2. 1.1. Vienna stakeholders' opinions: other stakeholders

A2. 1.2. Vienna stakeholders' opinions: challenges

A2. 2. Vienna implementation analysis

A2. 2.1. Vienna implementation analysis: stakeholders (before and now)

A2. 2.2. Vienna implementation analysis: projects (before and now)

A2. 2.3. Vienna implementation analysis: challenges (before and now)

A2. 1. Vienna stakeholders' opinions

A2. 1.1. Vienna stakeholders' opinions: stakeholders

	government	eco	know	civil society
Tanja Wehsely - Social city wien	Thomas madreiter			Thomas ritt
	ina homeier			
	klemens himpele (klemens.himpele@wien.g v.at)			
	thomas madreiter			
Christoff Schremmer-ÖIR	political parties. ie. Green party: Vasilakou	Herbert schereiner, siemens		VCÖ: mobility organization
Thomas Madreiter. director of planning Vienna city council	andreas Trisko MA18	Head oof siemmes austria, Mr HESOUN	Brigitte Bach AIT	
	Dominic Weiss TINA		Rudolf scheuvsen-	
			rudolf giffinger (TU wien)	
	thomas madreiter			paradoz- packhaus- derelicted buildings
Peter Kuhnberger - Wiengestalten	ina homeier			david.stanzel.gartenply log.org
	Dominic Weiss TINA			
	MA 22: environmental preservation,			
	thomas madreiter	siemens	universities	
Lukas Lang- Wien 3420 AG	Ina homeier		educational institutions (i.e. kindergarten)	
	TINA Wien			
			Expert in austrian standards: jörg nachbauer.	
	thomas madreiter			
Michael Hagler - Digital Agenda wien	Ina homeier			
	MA 23			
	project SMARTER TOGETHER (lyon, Munich, Vienna)			
	Andreas Trisko			ASK your neighbour
Klemens Himpele - MA23.statistics	Ulrike huemer			
	Michaela Stumpfer			
	WWTF			
	Fritz meissel WAFF			
Dominic Weiss- TINA	Wirtschaftsagentur			
	Peter Meierhofer, WIFO			
	thomas madreiter	reinhrd brenner (ppp siemmes + city of vienna) aspern sc director	Brigitte Bach	
	Ina homeier		martin russ. Austria tech	
	Andreas Trisko			

	ilse stockinger		
	ulrike huemer		
	ingolf scheeler austrian		
	ministry of tnasport		
	thomas madreiter	Ina homeier -Pia Havla	Brigitte Bach AIT Thomas ritt
			Rudolf scheuven(TU wien)
Verena Madner, WU			Rudolf giffinger (TU wien)
Michaela Stumpf, Car free district			
	Madreiter		
	Homeier		
Herwig Schreiner, Siemens	Wiener netze, wien energie		
	Wienewr linie		
	TINA Wien		Verena Madner
Christian Rammel, WU	social city wien-tanja wehsely		
	MA18	siemens	aRGUs (cilciyng ssociatin)
	Ina Homeier		caritas
Paul Pfaffenbichler,TU	wienere stadtwerke:ilse stockinger, michael lichtneggerm anna mayerhtaler		
	M18		TU wien
	TINA Wien		
	MA22 environment		
	M20 (wenergy)		
	wien energie		
Hans-Martin Neumman, AIT	M50, wiener housing		
	MA25 (housing)		

A2. 1.2. Vienna stakeholders' opinions: challenges

		Tanja Wehsely	Christof Schremmer-ÖIR	Thomas Madreiter, director	Peter Kuhnberger	Lukas Lang- Wien 3420	Thomas Ritt	Michael Hagler - Digital	Klemens Himpele	Dominic Weiss-TINA	Gebetsroither Ernst, AIT	Verena Madner	Michaela Stumpf	Hervig Schreiner	Christian Rammel	Paul Pfaffenbichler	Hans-Martin Neumann	
global trends	Climate Change	5	3	4	4	5	4	5	3	4	4	5	4	3	4	4	4	4,1
	Social Polarization	5	4	3	5	4	2	4	5	3	3	3	5	5	5	5	2	3,9
	Need for new governance models	5	5	4	4	5	2	5	3	2	4	3	3	3	5	3	3	3,7
	Global urbanization	5	2	3	5	4	4	5	2	5	2	1	4	4	3	3	2	3,4
	Economic instability	5	3	3	4	4	3	3	2	2	4	2	3	4		4	1	3,1
	Technology driven approaches to urban issues	5	3	2	2	3	3	5	4	2	3	2	4	4	3	3	3	3,2
challenges	Reducing ecological footprint and pressure over ecosystems, fostering ecological functions of land	3	4	3	4	4	3	4	3	4	4	4	5	2	4	5	4	3,8
	Implementing and coordinating new technologies for energy saving and emission reductions through planning and governance tools	3	4	2	4	4	2	5	4	4	5	4	5	4	3	4	4	3,8
	Managing adaptation to innovation and knowledge based economies while providing solutions to a broad skill base	5	3	2	5	4	2	5	4	2	3	4	4	5	4	3	4	3,7
	Improving effectiveness of institutions, coordination among public bodies and multilevel governance (leading to more integrated sectoral policies)	5	5	2	4	4	4	4	4	3	4	3	4	4	5	4	5	4,0
	Promoting equity in access to labour market and conciliation of work and family life	5	3	2	5	4	4	4	4	2	3		5	5	4	5	3	3,9
	Implementing a holistic approach to environmental issues	3	5	3	4	3	3	4	3	5	5	3	4	4	4	5	2	3,8
	Fostering social inclusion and cohesion	5	4	4	4	4	5	5	5	5	4	4	4	4	5	5	2	4,3
	Increasing efficiency in resources management (energy, water, etc) and circular economy	3	4	4	4	4	2	5	3	4	5	3	5	3	4	5	3	3,8
	Articulating mobility planning tools and policies with innovations in the sector	4	5	3	4	5	2	3	4	4	4	2	5	3	3	4	4	3,7
	Fostering human and social capital as source of innovation	5	5	4	5	5	4	4	5	4	4	3	5	4	3	4	2	4,1
	Fostering sustainable accessibility in cities and promoting sustainable, inclusive and healthy mobility when needed	4	5	3	5	3	3	4	3	3	4	3	5	3		5	3	3,8
	Eradicating spatial exclusion and promoting equity in access to housing and quality urban environments	5	3	3	5	4	4	4	4	4	4	2	4	3	3	4	2	4,0
	Enhancing social diversity as a dynamic asset	5	3	4	5	4	3	4	4	2	5	4	4	4	3	4	3	4,0

Shifting to more participative and inclusive democracy	5	4	3	4	4	2	5	2	1	4	4	5	2	4	3	3	3,4
Enhancing equity within society	5	4	4	5	4	5	4	3	2	4	3		2	4	5	2	3,7
Developing a coordinated Climate Change mitigation strategy	3	5	4	4	4	3	3	3	3	4	3	5	3	4	5	4	3,6
Fostering resilience of cities regarding climate change and disasters risks	3	3	4	4	3	2	3	2	2	5	3	4	2	4	5	4	3,1
Reducing externalities of new technologies implementation (i.e. cybersecurity)	3	3	5	3	3	4	4	5	3	4	2	5	3	3	4	2	3,5
Enhancing territorial cohesion	3	4	3	2	1	2	3	3	2	5	2	5	3	3	3	1	2,8
Managing urban population growth while reducing negative externalities	5	5	4	5	4	4	5	5	4	5	4	5	2	3	5	3	4,3
Fostering citizenship urban cocreation and comanagement combining top-down and bottom-up models	5	4	4	4	4	3	5	3	3	5	4	4	3	5	3	4	3,9
Strengthening inclusion of migrants and refugees	5	4	3	5	5	4	5	5	2	5	5	5	3	5	5	4	4,4
Adapting the city economic and social life to ageing population while attracting young and children	5	3	2	4	3	3	4	2	3	5	4	5	5	3	4	2	3,6
Developing eco-friendly urban environments and answering to growing environmental concerns	3	5	2	3	4	3	4	3	3	4	2	5	4	3	4	4	3,5
Balancing urban growth and territorial development (urban-rural balance management)	4	5	3	4	3	4	3	3	2	5	5	5	2	3	4	1	3,5
Improving resiliency of economic systems and adaptation to changes in global and local economies	5	4	4	5	4	3	3	5	2	4	3	5	3	4	4	2	3,8
Maintaining quality of life in cities assuring access to services according to changes in demand (education, health, culture, safety, etc)	5	4	4	4	3	5	4	5	5	4	4	5	4	4	3	3	4,1
Increasing flexibility and resiliency of governance models	5	5	3	4	3	4	3	4	4	3	4	5	2	4	4	4	3,8
Fostering technological innovation driven by social and human capital	5	3	2	4	4	2	5	4	3	4	2	5	3	3	3	4	3,5
Enhancing integration in global economies promoting cooperation among cities and territories	5	3	3	3	3	2	3	4	3	3	2	5	4	3	4	2	3,3
Fostering employment creation with high quality standards	5	4	4	4	3	5	5	5	2	4	4	5	3	3	4	2	3,9
Achieving balance between competitiveness and quality of life	4	3	3	4	4	3	4	5	2	5	2	4	4	3	3	2	3,4
Enhancing adaptation of society, governance and economy to transformations through ICT	5	3	3	4	3	2	5	3	3	3	2	4	4	3	2	4	3,4
Improving sustainability and diversity of local economies in balance with cities specialization	4	3	2	4	4	3	4	4	4	4	2	5	3	3	4	2	3,6
Fostering interurban variety and cities willingness and protecting cultural heritage	3	3	2	4	2	3	4	3	2	5	3	5	2	2	4	2	3,1
Developing new planning tools for sustainable development (less urban sprawl, policentric plans, increased density and diversity, mixed land use, urban refurbishment...)	3	5	2	2	4	3	4	2	3	5	3	5	2	2	5	3	3,3
Incorporating and regulating innovative management systems at local level while improving capacity building (ie. PPP or PPPP, e-governance,etc)	4	4	3	2	3	2	5	4	3	4	2	4	3	2	3	4	3,3

A2.2. Vienna implementation analysis

A2.2.1. Vienna implementation analysis: stakeholders' analysis (before and now)

Projects (before)		Entities involved Vienna	type of stakeholders
1	URBEM – DK	TU Wien	knowledge
		Wiener Stadtwerke	local government company
2	aspern.mobil - Mobility Lab in Seestadt Aspern	Landschaftsplanerin Martina Jauschneg.	company
		Wien 3420 Aspern Development GmbH	company
		TU Wien (Department für Raumplanung)	knowledge
		Neue Urbane Mobilität Wien GmbH	local government company
3	PUMAS: mobility concept for the corridor Vienna - airport region	TINA Vienna	local government company
		TINA Vienna GmbH	local government company
4	ZENEM - future energy networks with electromobility	Taxi31300	company
		AIT (Austrian Institute of technology)	knowledge
		TU Wien	knowledge
		MA 18	local government
		Wien energie Stromnetz	local government company
		ETA Umweltmanagement GmbH	company
		ARBOS management advisors GmbH	company
		ARAC GmbH	company
		ÖIR GmbH (Konsortialführer)	company
		Siemens AG Österreich	company
		Wien 3420 Aspern Development AG	company
		AIT – Austrian Institute of Technology GmbH, Energy Department	knowledge
		TU Wien, Institut für Verkehrswissenschaften	knowledge
		WU Wien, Institut für Logistik und Transportwirtschaft	knowledge
		MA 18 Stadtentwicklung und Stadtplanung	local government
		MA 20 Energieplanung	local government
		MA 21 Stadtteilplanung und Flächennutzung	local government
		Energiecomfort Energie- und Gebäudemanagement GmbH	local government company
		Wien Energie GmbH	local government company
5	Transform +	Wiener Netze GmbH	local government company
		Wiener Stadtwerke Holding AG	local government company
		Neue Urbane Mobilität Wien GmbH	local government company
		EUROCITIES	civil society
		AIT-Austrian Institute of technology	knowledge
		VTT- Technical Research Centre of Finland, Finland	knowledge
		TNO-Netherlands Organisation for Applied Scientific Research, the Netherlands	knowledge
		City of tarragona	local government
		Zaragoza	local government
		City of rotterdam	local government
6	CityKeys	City of rotterdam	local government

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		city of tampere	local government
		MA 18	local government
		Denkstatt GmbH ;	company
		AIT – Austrian Institute of Technology GmbH	knowledge
		WWTF – Wiener Wissenschafts-, Forschungs- und Technologiefonds	local government
7	(Deutsch) Forschungsprojekt SMART.MONITOR	TINA Vienna GmbH;	local government company
		Siemens	company
		Wien 3420 Aspern Development AG	company
		Aspern Smart City Research GmbH & Co KG (ASCR)	knowledge
		wien Energie	local government company
		Wiener Netze	local government company
8	Smart Cities Demo Aspern (SCDA)	wirtschafts agentur Wien	local government company
		Boku Wien	knowledge
		RCE Vienna	knowledge
		WU Wien	knowledge
9	CASE - Competencies for A sustainable Socio-Economic development	Wiener Stadtwerke	local government company
		Greenovate Europe	civil society
		Çgreen Building council SKGBC	civil society
		gewoge aagen	company
		Synergie- KOM	company
		Zabala innovation consulting	company
		Rockwool	company
		Wolf Artec	company
		IC consulenten	company
		alPs	company
		VTT	knowledge
		Sveriges tekniska Forskningsinstitut SP	knowledge
		Politecnico di Milano	knowledge
		Technical Research Institute of Slovakia TSUS	knowledge
		National Renewable energy Center (CENER)	knowledge
		boku	knowledge
		STAWAG STDWERKE AACHEN	local government
		City of aachen	local government
		City of Gotheborg	local government
		city of tampere	local government
		Aler milano	local government
		City of Milan	local government
		Agenzia Mobilita Medio ambiente e Teritorio AMAT	local government
		Gazantiep metropolitan municipality	local government
		City of Bratislava	local government
		Sestao Berri 2010	local government
		city of Vienna	local government
10	EU-GUGLE	Ente Vasco de la Energía EVE	regional government
11	CLUE	MA 18	local government
		OIR	company
		AIT	knowledge
12	TRANSFORMAtion Agenda for Low Carbon Cities	MA 19	local government
13	ehealth	MA 24 – Gesundheits- und Sozialplanung	local government

		IKT	Magistratsdirektion,	Geschäftsbereich	
		MDOS			
		IKT			local government
14	mobile health		MA 24 – Gesundheits- und Sozialplanung		local government
15	Seniorpad		MA 24 – Gesundheits- und Sozialplanung		local government
16	Boutiquehotel Stadthalle: City hotel with a zero-energy balance		Boutiquehotel Stadthalle		company
			Austrian Savings Banks AG		company
			Vienna Insurance Group		company
			Bundesimmobiliengesellschaft (BIG)		company
			Wien 3420 AG		company
			Stadt Wien(Wien 3420 AG is owned by GELUP GmbH (a subsidiary of the Vienna Business Agency,		local government
			wohnfonds_wien		local government
			Wiener Wirtschaftsförderungsinstitut (WIFI-Wien)		local government company
17	asperrn Vienna's Urban Lakeside		Wirtschaftsagentur Wien		local government company
18	(Deutsch) Kabelwerk		Kabelwerk Bauträger GmbH		company
19	(Deutsch) Technologiezentrum aspern IQ				local government company
20	Campus WU: Room for a University of the Future				knowledge
			TU Wien (CD Labor Anthropogene Ressourcen)		knowledge
			MA 22 Umweltschutz Stadt Wien –		local government
21	Hochbauten als Wertstoffquelle		MD-BD Stadtbaudirektion (Gruppe Umwelttechnik und behördliche Verfahren, Gruppe Hochbau) (Stadt Wien)		local government
22	Marxbox: Austria's First "Green" Laboratory Building"		Wiener Stadtentwicklungsgesellschaft		company
			Förderung der Kommunikation und Kooperation in der autofreien Siedlung Floridsdorf (KOKOS)		civil society
23	Car-free Living		GEW'OG-New home		company
24	Bike City		Gesiba		company
			Vossloh Kiepe		company
			Rail Tec Arsenal		company
			Siemens		company
			TU Technical University of Vienna		knowledge
			Wiener Linien GmbH & Co KG		local government company
25	Energy-saving Tram		SCHIG mbH		national government company
			Stadt Wien		local government
26	Vienna Main Station		ÖBB		national government company
27	Urban Development Plan 2025 (STEP)		MA 18		local government
			Ö3-Verkehrsredaktion		company
			ASFiNAG		company
			Taxiunternehmen		company
			Polizei		local government
			ITS Vienna Region (Informations- und Kommunikationstechnologie (IKT) (MA 14))		local government
			Wiener Linien		local government company
28	AnachB - smart from A to B		ÖBB		national government company

	Verkehrsverbund Ost-Region (VOR)	regional company	government
29	Target area Liesing Mitte	MA 21	local government
	e-Pendler in Niederösterreich	?	
	Renault	company	
	BMW und HUBJeCT	company	
	Bundesverband Elektromobilität Österreich (BEÖ)	company	
	Wien Energie: Kooperation für Elektromobilität mit Renault	company	
	Vibrate_klein_angepasst		
	VIBRAte – Vienna BRATislava e-mobility	company	
	Vibrate_klein_angepasst		
	VIBRAte – Vienna BRATislava e-mobility	company	
	VW Austria	company	
	Neue Urbane Mobilität Wien GmbH	local company	government
	Wien Energie: Kooperation für Elektromobilität mit Renault	local company	government
	Wiener Modellregion	local company	government
30	(Deutsch) E-Taxis	Wiener Stadtwerke	local company government
31	Citybike Vienna	Citybike Wien	local company government
	EMIL	?	
	car2go	company	
	e-carage Elbl	company	
	Energie Steiermark	company	
	Graz Bike	company	
	Twin-City-Liner	company	
	nextbike	company	
	Taxi 31300	company	
	emorail	local company	government
	Wien Energie Tanke	local company	government
	Wiener Linien	local company	government
	Wiener Stadtwerke	local company	government
	WIPARK	local company	government
	e-mobility Graz	local company	government
	Linz Linien	local company	government
	citybike	local company	government
32	SMILE	ÖBB	national company public
33	INWAPO	UIV Urban Innovation Vienna GmbH	company
	UIV Urban Innovation Vienna GmbH	company	
	nast consulting	company	
	University of Applied Sciences BFI Vienna	knowledge	
	TU Vienna,	knowledge	
34	Smart Hubs 2.0	FFG	national government
35	Optihubs	UIV Urban Innovation Vienna GmbH	company

	nast consulting	company
	Hafen Vienna	company
	University of Applied Sciences BFI Vienna	knowledge
	TU Vienna,	knowledge
	Energy Center	local government
	municipal department “Energy Planning” (MA20),	local government
36 Smart Services	UIV Urban Innovation Vienna GmbH	local government company
37 e-mobility on demand	Wiener Stadtwerke	local government company
38 CO2 neutral post	Österreichische Post AG	national government company
39	municipal department for road management and construction (MA28)	local government
	weatherpark	company
	Weatherford Park.	company
	ma 28 Abteilung Straßenbau und Straßenverwaltung	local government
40 Weatherpark - Windkomfort-Optimierung für den Stadtteil Hauptbahnhof Wien	ÖBB	national government company
40 The MA 48 Waste App	MA 48	local government
	Arbeiterkammer Wien (AK-Wien)	civil society
	Österreichischer Gewerkschaftsbund (ÖGB)	civil society
	Wirtschaftskammer Wien (WKW)	local government
	MA 22 -Wiener Umweltschutzabteilung	local government
	MA 36 Gewerbetechische Sachverständige der Magistratsabteilung für Technische Gewerbeangelegenheiten, behördliche Elektro- und Gasangelegenheiten, Feuerpolizei und Veranstaltungswesen (MA 36),	local government
	Magistratische Bezirksämter als Gewerbebehörde	local government
	Wiener Wirtschaftsförderungsinstitut (WIFI-Wien)	local government company
	Wirtschaftsagentur Wien/ZIT	local government company
	Umwelt und Wasserwirtschaft (BMLFUW)	national government
41 EcoBusinessPlan	Bundesministerium für Land- und Forstwirtschaft	national government company
42 EOS – Energy from Sewage Sludge	ebswien hauptkläranlage	local government company
43 SternE – renewable energy in the main wastewater treatment plant	ebswien hauptkläranlage	local government company
44 (Deutsch) ÖkoKauf Wien	ÖkoKauf Wien	local government
45 (Deutsch) LED-Technik in der öffentlichen Beleuchtung	MA 33 "Wien Leuchtet" (	local government
46 (Deutsch) Photovoltaik-Dachgarten	BOKU Wien Institut für Ingenieurbiologie und Landschaftsbau der	knowledge
47 (Deutsch) Trinkwasserkraftwerke	MA 31 Wiener Wasser	local government
	PRISMA solutions EDV-Dienstleistungen GmbH	company
	University of Natural Resources and Life Sciences	knowledge
	ater plant in Waidhofen/Ybbs	local government
48 CC-Ware	Forestry Division (Dept. IV/4) of the Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW).	national government
49 INNOSPIRIT	MA 31 Wiener Wasser	local government

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50	Vienna Sewer Simmering	Wien Kanal (WKN)	local company	government
51	IMPALA	UIV Urban Innovation Vienna GmbH	local company	government
		Technologieoffensive Burgenland	company	
		AEE Energiedienstleistungen GmbH	company	
		Gerhard Moritz	company	
		Grazer Energieagentur	local company	government
		Salzburger Institut für Raumordnung	local company	government
		UIV Urban Innovation Vienna GmbH	local company	government
		Energie Tirol	regional entity	
		Energieinstitut Vorarlberg	regional entity	
		Energie- und Umweltagentur Niederösterreich, Technologieoffensive Burgenland, Salzburger Institut für Raumordnung, Energie Tirol, Energieinstitut Vorarlberg, Grazer Energieagentur (as well as AEE Energiedienstleistungen GmbH, Verein Komfortlüftung.at and Gerhard Moritz as subcontractor)	regional government	
52	Programm "klimaaktiv erneuerbare Wärme"	Magistrat der Stadt Wien (AT),	local government	
		Miasto Stołeczne Warszawa (PL)	local government	
		Ville de Paris (FR)	local government	
		Gemeente Amsterdam (NL)	local government	
		Gemeente Zaanstad (NL)	local government	
		Stockholm Stad (SE)	local government	
		Grad Zagreb (HR),	local company	government
		Energetski Institut Hrvoje Pozar (HR)	local company	government
		Berliner Energieagentur GmbH (DE)	local company	government
		Agence Parisienne du Climat (FR)	local company	government
53	URBAN LEARNING	UIV Urban Innovation Vienna GmbH	local company	government
54	Urban Mining	Kranner GmbH	company	
		Erstes	company	
	Social City Vienna - Platform for Social Innovation	Wiener stadtsische Versicherungsverein	company	
55		Smart city wien	local government	
56	Citizens' Solar Power Plants	Wien Energie GmbH	local company	government
57	(Deutsch) Wien Gestalten	Dialog Plus	company	
		Verein Gartenpolylog	civil society	
		Gebietsbetreuung – Garteln ums Eck	local government	
		MA 42 Wiener Stadtgärten): Nachbarschaftsgärten und Förderungen	local government	
58	(Deutsch) Urban Farming und Gardening	MA 49: Forstamt und Landwirtschaftsbetrieb der Stadt Wien (: Anträge für Ökoparzellen	local government	
59	Open Government Data	City of Wien	local government	
60	wien.at Public WLAN	City of Wien	local government	
61	DigitalCity.Wien	City of Wien	local government	
62	(Deutsch) Digitale Agenda Wien	IKT Stadt Wien – Magistratsdirektion - Geschäftsbereich Organisation und Sicherheit - Gruppe Prozessmanagement und IKT-Strategie (PIKT)	local government	
63	(Deutsch) E-Government und Virtuelles Amt	?	local government	
64	(Deutsch) wien.at live-App	IKT Magistratsdirektion – Geschäftsbereich Organisation und Sicherheit – Gruppe Informations- und Kommunikationstechnologie	local government	

Projects (now)	Entities involved Vienna	stakeholder type
1 Neighborhood oasis	Local Agenda 21 Vienna	local government
2 Smarter together	MA 25 – Municipal Department of Urban Renewal & Inspecting Authority for Residential Buildings	local government
	DIE UMWELTBERATUNG	civil society
	Municipal Department for Environmental Protection (MA 22)	local government
3 Energy saving license	Municipal Department for Energy Planning (MA 20).	local government
	Johanniter Österreich Ausbildung und Forschung gemeinnützige GmbH	civil society
	Austrian Institute of Technology	knowledge
	TU Wien	knowledge
	Fonds Soziales Wien	local government
	City of Vienna, Chief Executive Office – Executive Group for Organisation and Security – Work Group for Process Management and ICT-Strategy (MD-OS/PIKT)	local government
	Urban Innovation Vienna GmbH	local government
	Wiener Sozialdienste Alten- und Pflegedienste GmbH	local government
	BMVIT/FFG	national government
	Wirtschaftspsychologische Unternehmensberatung GmbH	private company
	Microtronics Engineering GmbH	private company
	Dr. Bernard Rupp	private company
	CogVis Software und Consulting GmbH	private company
	ILOGS Mobile Software GmbH	private company
4 WAALTER	FragNebenan GmbH	private company
5 TREEDAY	TREEDAY GmbH	private company
6 Optimal microclimate in Aspern	Weatherpark GmbH	private company
	Municipal Department 65 – Legal Affairs: Transport and Traffic	local government
	Municipal Department 65 – Legal Affairs: Transport and Traffic	local government
7 Wien gibt raum		local government
8 Thematic city map "Energy"	Municipal Department 20 – Energy Planning	local government
9 Wiener tafel	Wiener Tafel – Verein für sozialen Transfer	civil society
10 Power-2-heat	Wien Energie GmbH	local government
	Wien Energie GmbH	local government
	Riddle & Code	private company
	Enerchain Gas	private company
	BP	private company
	Eni	private company
11 Blockchain in the energy sector	blockchain start-up BTL	private company
	Municipal Department 17 (Integration and Diversity)	local government
	Vienna Social Fund (Fonds Soziales Wien)	local government
	Vienna Employment Promotion Fund (waff)	local government
	Vienna Business Agency	local government
12 CORE-integration center	Vienna Board of Education/European Office	local government
	wiener netze	local government company
	Wien Energie GmbH	local government company
	wirtschaft agentur wien	local government company
	Siemens	private company
13 Aspern Smart City research	wien 3420	private company

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		TU Wien – Department für Raumplanung	knowledge
		TU Wien – Institut für Energiesysteme	knowledge
		tatwort Nachhaltige Projekte GmbH (project lead),	private company
	Pocket Mannerhatten	Arch. DI Florian Niedworok – Studio Mannerhatten,	private company
14	Ottakring	Elektrische Antriebe, DDr. Gebhard Klötz	private company
15	Wienbot	Wien city hall	local government
		Central Institute for Meteorology and Geodynamics (ZAMG)	Central government
		TU Graz	knowledge
16	Smart Traffic lights	Municipal Department 33 – Public Lighting	local government
17	Blockchain in the energy sector	consultant Ernst & Young	private company
17	Temporary offices buildings at Heldenplatz	Lukas Lang Building Technologies GmbH	private company
18	Leila	Verein Leila Wien	civil society
		Technical University Vienna	knowledge
		Municipal Department 29 – Bridge Construction and Foundation Engineering	local government
		Municipal Department 39 (Research Centre, Laboratory and Certification Services)	local government
19	Research projects unteres Hausfled	Smart Minerals Ltd	private company
20	Vienna research festival	Vienna Business Agency	local government
		BOKU (University of Natural Resources and Life Sciences)	knowledge
		Institute of Meteorology-boku	knowledge
		Municipal Department for Waste Management (MA48)	local government
		Municipal Department for Parks and Gardens (MA42)	local government
		TECH METALL	private company
		Dachgrün	private company
21	Green façades in Vienna	Rataplan Architektur ZT GmbH	private company
22	Future jobs	Vienna Business Agency	local government
		mart Buildings team of the AIT Austrian Institute of Technology	knowledge
		Vienna Business Agency	local government
		Port of Vienna	local government
		Municipal Department 33 – Public Lighting,	local government
		Melecs EWS	private company
		Tele Haase Steuergeräte.	private company
		gizmocraft design and technology	private company
23	Co-creation lab in Vienna	Xylem Technologies	private company
		Australian Living Labs Innovation Network (Australia)	civil society
		Vienna Economic Chamber (Transport and Communications)	civil society
		BOKU (University of Natural Resources and Life Sciences)	knowledge
		City of Vienna,	local government
		Port of Vienna	local government company
		Wienholding	local government company
		WIENER LINIEN GmbH & Co KG,	local government company
		Heavy Pedals (Lastenradtransport und -verkauf OG), ,	private company
		Effizienzcluster Management GmbH-Mülheim an der Ruhr (Germany)	private company
		G. Zoubek-Vertriebs-KG (Adamah),	private company
		iMinds Living Labs of Ghent University (Belgium)	private company
24	thinkport Vienna	NetPort Science Park AB (Karlshamn, Sweden	private company

		Executive Group for Construction and Technology, StoreMe GmbH (Austria),	private company
		Scania Österreich Ges.m.b.H.,	private company
		Sustain SA	private company
		Federal Ministry for Transport, Innovation and Technology (bmvit)	National government
		Wiener Linien GmbH und Co KG	local government company
		FTI Innovation Fund of Wiener Stadtwerke	local government company
25	Energy from metro brakes	Wiener Lokalbahn.	local government company
		EFRE (EU)	international entity
		Municipal Department 18	local government
		stadt wien	local government
		Urban Innovation Vienna GmbH	local government
	Smart City Wien framework	ma14	local government
26	strategy monitoring	wien vorhau	local government
27	Smart Campus	Wiener Netze GmbH	local government company
28	Sag's wien application	Municipal Department 14	local government company
		cetus Baudevelopment GmbH	private company
		RLP Rüdiger Lainer + Partner,	private company
		RWT plus ZT GmbH,	private company
		Kunz – die innovativen Brandschutzplaner,	private company
29	ho ho vienna	Handler Gruppe	private company
		University of Natural Resources and Life Sciences Vienna	knowledge
		Municipal Department for Road Management	local government
		Chief Executive Office – Executive Group for Construction and Technology	local government
		Municipal Department 42 – Parks and Gardens	local government
		Municipal Department 45 – Water Management	local government
		Municipal Department 48 – Waste Management, Street Cleaning and Vehicle Fleet	local government
		Vienna Sewage	local government
		Wien 3420 Aspern Development AG	private company
30	Dual infiltration model	Engineering Office Neukirchen ZT-GmbH	private company
31	Vienesse campus model	MA 56 – Vienna Schools	local government
		TU Wien (Institut für Verfahrenstechnik, Umwelttechnik und Technische Biowissenschaften)	knowledge
		BOKU (University of Natural Resources and Life Sciences)	knowledge
		Austrian Climate and Energy Funds	national government
		LGV Frischgemüse.	private company
32	ViennaGreen CO2	Shell	private company
33	DigitalCity.Wien	city of vienna	local government
34	wien.at Public WLAN	city of vienna	local government
		football club Rapid Wien	civil society
		City of wien	local government
		Wiener Stadtwerke,	local government company
		Pöyry Management Consulting Austria GmbH	private company
		Tech Metall	private company
		Hutchinson Drei,	private company
		Kelag,	private company
35	hanging gardens of Oberlaa	APG	private company

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

36	Vienna sewer Simmerling	Wien Kanal (WKN)	local government company
37	Weatherpark - Windkomfort-Optimierung für den Stadtteil Hauptbahnhof Wien	municipal department for road management and construction (MA28)	local government
38	(Deutsch) Digitale Agenda Wien	IKT Stadt Wien – Magistratsdirektion - Geschäftsbereich Organisation und Sicherheit - Gruppe Prozessmanagement und IKT-Strategie (PIKT)	local government
39	(Deutsch) LED-Technik in der öffentlichen Beleuchtung	MA 33 "Wien Leuchtet" (	local government
40	(Deutsch) E-Government und Virtuelles Amt	?	local government
41	HEAT-re-USE Vienna	Austrian Institute of Technology (AIT)	knowledge
42	Make your city smart	TU Wien	knowledge
43	Mischung possible	TU Wien	knowledge
44	Programm "klimaaktiv erneuerbare Wärme"	Grazer Energieagentur	local government company
		Salzburger Institut für Raumordnung	local government company
		UIV Urban Innovation Vienna GmbH	local government company
		Technologieoffensive Burgenland	private company
		AEE Energiedienstleistungen GmbH	private company
		Gerhard Moritz	private company
		Energie- und Umweltagentur Niederösterreich, Technologieoffensive Burgenland, Salzburger Institut für Raumordnung, Energie Tirol, Energieinstitut Vorarlberg, Grazer Energieagentur (as well as AEE Energiedienstleistungen GmbH, Verein Komfortlüftung.at and Gerhard Moritz as subcontractor)	regional government
		Energie Tirol	regional government company
		Energieinstitut Vorarlberg	regional government company
45	Smart block step II Wien	Mag.a Jutta Wört-Gössler	private company
46	Smart City in public housing	Energieinstitut	private company
47	Smart Services	Energy Center	local government
		municipal department "Energy Planning" (MA20),	local government
		UIV Urban Innovation Vienna GmbH	private company
48	ICT integration Vienna Aspern	Aspern Smart City Research	private company
49	URBAN LEARNING	Magistrat der Stadt Wien (AT),	local government
		Miasto Stołeczne Warszawa (PL)	local government
		Ville de Paris (FR)	local government
		Gemeente Amsterdam (NL)	local government
		Gemeente Zaanstad (NL)	local government
		Stockholm Stad (SE)	local government
		Grad Zagreb (HR),	local government company
		Energetski Institut Hrvoje Pozar (HR)	local government company
		Berliner Energieagentur GmbH (DE)	local government company
		Agence Parisienne du Climat (FR)	local government company
			local government company
		UIV Urban Innovation Vienna GmbH	local government company
		University of Natural Resources and Life Sciences	knowledge
50	CC-Ware	ater plant in Waidhofen/Ybbs	local government

		Forestry Division (Dept. IV/4) of the Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW).	national government
		PRISMA solutions EDV-Dienstleistungen GmbH	private company
51	(Deutsch) wien.at live-App	IKT Magistratsdirektion – Geschäftsbereich Organisation und Sicherheit – Gruppe Informations- und Kommunikationstechnologie	local government
52		e-Pendler in Niederösterreich	?
52		Neue Urbane Mobilität Wien GmbH	local government company
52		Wien Energie: Kooperation für Elektromobilität mit Renault	local government company
52		Wiener Modellregion	local government company
52		Wiener Stadtwerke	local government company
52		Renault	private company
52		BMW und HUBJeCT	private company
52		Bundesverband Elektromobilität Österreich (BEÖ)	private company
52		Wien Energie: Kooperation für Elektromobilität mit Renault	private company
52		Vibrate_klein_angepasst VIBRAte – Vienna BRATislava e-mobility	private company
52		Vibrate_klein_angepasst VIBRAte – Vienna BRATislava e-mobility	private company
52	(Deutsch) E-Taxis	VW Austria	private company
54	(Deutsch) Wien Gestalten	Dialog Plus	private company
56	(Deutsch) Trinkwasserkraftwerke	MA 31 Wiener Wasser	local government
57	(Deutsch) Photovoltaik-Dachgarten	BOKU Wien Institut für Ingenieurbiologie und Landschaftsbau der	knowledge
	Social City Vienna - Platform for Social Innovation	Smart city wien	local government
58		Erstes	private company
60	(Deutsch) ÖkoKauf Wien	Wiener stadtsische Versicherungsverein	private company
		ÖkoKauf Wien	local government
		Polizei	local government
		ITS Vienna Region (Informations- und Kommunikationstechnologie (IKT) (MA 14))	local government
		Wiener Linien	local government company
		ÖBB	national company
		Ö3-Verkehrsredaktion	private company
		ASFiNAG	private company
		Taxiunternehmen	private company
63	AnachB - smart from A to B	Verkehrsverbund Ost-Region (VOR)	regional government company
		Verein Gartenpolylog	civil society
		Gebietsbetreuung – Garteln ums Eck	local government
		MA 42 Wiener Stadtgärten): Nachbarschaftsgärten und Förderungen	local government
66	(Deutsch) Urban Farming und Gardening	MA 49: Forstamt und Landwirtschaftsbetrieb der Stadt Wien (): Anträge für Ökoparzellen	local government
69	EOS – Energy from Sewage Sludge	ebswien hauptkläranlage	local government company
70	The MA 48 Waste App	MA 48	local government
70	Weatherpark - Windkomfort-Optimierung für den Stadtteil Hauptbahnhof Wien	weatherpark	private company
72	Open Government Data	city of vienna	local government

73	CO2 neutral post	Österreichische Post AG	national company	public
		Arbeiterkammer Wien (AK-Wien)	civil society	
		Österreichischer Gewerkschaftsbund (ÖGB)	civil society	
		Wirtschaftskammer Wien (WKW)	local government	
		MA 22 -Wiener Umweltschutzabteilung	local government	
		MA 36 Gewerbetechische Sachverständige der Magistratsabteilung für Technische Gewerbeangelegenheiten, behördliche Elektro- und Gasangelegenheiten, Feuerpolizei und Veranstaltungswesen (MA 36),	local government	
		Magistratische Bezirksämter als Gewerbebehörde	local government	
		Wiener Wirtschaftsförderungsinstitut (WIFI-Wien)	local government	
		Wirtschaftsagentur Wien/ZIT	local government company	
		Bundesministerium für Land- und Forstwirtschaft	national government	
74	EcoBusinessPlan	Umwelt und Wasserwirtschaft (BMLFUW)	national government	
		Stadt Wien	local government	
75	Vienna Main Station	ÖBB	national government	
76	City bike vienna	Citybike Wien	local government company	
78	Urban Mining	Kranner GmbH	private company	
79	SternE – renewable energy in the main wastewater treatment plant	ebswien hauptkläranlage	local government company	
80	Urban Development Plan 2025 (STEP)	MA 18	local government	
81	Citizens' Solar Power Plants	Wien Energie GmbH	local government company	

Vienna projects analysis (before)

Vienna projects analysis (before)		DIMENSIONS																																																
		Smart Governance		Smart Economy		Smart Mobility				Smart Environment				Smart People				Smart Living																																
		PROJECT ACTIONS																																																
		gov	eco	mob	env	peo	liv	TOTAL	SGo1. Participation	SGo2. Transparency and information	SGo3. Public and Social Services	SGo4. Multi-level governance	SGo5. Community building and social life	SGo6. Efficiency in municipal services	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global Initiatives	SEc4. Productivity	SEc5. Flexibility and conciliation in labour market	SMo1. Accessibility	SMo2. Clean, non-motorised options	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and environmental management	SEn2. Energy efficiency	SEn3. Urban planning and urban environment	SEn4. Smart buildings and building environment	SEn5. Resources management	SEn6. Environmental protection	SEn7. Awareness rising and behavioural change	SPE1. education and digital training	Spe2. Research	Spe3. Creativity	SPE4. ICT - Enabled working environment	SPE5. Inclusive society	SLi1. Culture and leisure	SLi2. Healthcare	SLi3. Security	SLi4. Technology accessibility	SLi5. Welfare & Social inclusion	SLi6. Public spaces management	SLi7. Tourism					
1	URBEM – DK			1	1	1	1	4																		1	1		1	1	1												1							
2	aspermobil - Mobility Lab in Seestadt Aspern	1		1		1		3	1												1	1	1	1	1	1	1			1															1					
3	PUMAS: mobility concept for the corridor Vienna - airport region	1		1		1		3	1			1									1	1	1	1	1	1	1																							
4	ZENEM - future energy networks with electromobility			1	1	1		3														1							1																					
5	Transform +	1		1	1	1		4	1												1	1	1	1	1	1	1		1	1	1	1																		
6	CityKeys	1				1		2	1					1															1																					
7	(Deutsch) Forschungsprojekt SMART.MONITOR	1		1	1	1		4						1							1	1	1	1	1	1	1	1	1		1			1																
8	Smart Cities Demo Aspern (SCDA)	1		1	1	1		4	1																		1			1			1																	
9	CASE - Competencies for A sustainable Socio-Economic development		1		1	1		3								1	1																	1																
10	EU-GUGLE				1	1		2																																										
11	CLUE	1		1	1	1		4	1					1														1		1	1		1																	
12	TRANSFORMation Agenda for Low Carbon Cities	1			1	1		3	1					1															1	1	1																			
13	e Health	1					1	2			1																																							
14	Mobile Health	1				1	1	3			1																																							
15	Seniorpad	1				1	1	3			1																																							
16	Boutiquehotel Stadthalle: City hotel with a zero-energy balance		1		1		1	3								1													1			1	1																	1
17	asperm Vienna's Urban Lakeside	1		1	1	1	1	5	1													1	1	1	1	1	1		1	1	1	1	1						1							1				
18	(Deutsch) Kabelwerk	1		1	1	1	1	5	1			1											1	1			1		1	1	1	1									1	1								
19	(Deutsch) Technologiezentrum aspern IQ		1		1			2								1												1	1			1	1																	
20	Campus WU: Room for a University of the Future				1	1	1	3																				1	1	1	1																		1	
21	Hochbauten als Wertstoffquelle				1			1																																										
22	Marxbox: Austria's First "Green" Laboratory Building"				1	1		2																					1			1																		
23	Car-free Living	1		1	1		1	4	1				1									1	1	1	1		1		1	1	1																		1	
24	Bike City	1		1	1		1	4	1				1									1								1	1																			1
25	Energy-saving Tram			1	1			2														1	1					1	1																					
26	Vienna Main Station	1		1	1		1	4	1												1		1	1					1	1	1	1																	1	
27	Urban Development Plan 2025 (STEP)	1	1	1	1		1	5	1				1				1					1	1	1	1	1	1				1																			
28	AnachB - smart from A to B			1	1			2													1	1	1	1	1	1				1																				
29	Target area Liesing Mitte	1	1	1	1		1	5	1								1						1						1	1			1	1														1		
30	(Deutsch) E-Taxis		1	1	1	1	1	5								1					1	1	1						1																	1	1			
31	Citybike Vienna			1	1			2													1	1	1						1																					
32	SMILE			1	1			2	1												1	1	1																											
33	INWAPO			1	1			2																1	1																									
34	Smart Hubs 2.0	1		1	1	1		4				1									1			1	1					1																				
35	Optihubs			1	1			2				1									1			1	1					1																				
36	Smart Services	1	1		1	1		4	1							1	1												1	1																				
37	e-mobility on demand			1	1	1		3													1	1	1	1					1																					
38	CO2 neutral post			1	1	1		3														1			1			1	1		1																			

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Vienna projects analysis
(now)

Vienna projects analysis (now)								DIMENSIONS																																						
								Smart Governance			Smart Economy			Smart Mobility				Smart Environment				Smart People			Smart Living																					
								PROJECT ACTIONS																																						
		gov	eco	mob	env	peo	liv	TOTAL	SGo1. Participation	SGo2. Transparency and	SGo3. Public and Social	SGo4. Multi-level governance	SGo5. Community building	SGo6. Efficiency in municipal	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global	SEc4. Productivity	SEc5. Flexibility and	SMo1. Accessibility	SMo2. Clean, non-motorised	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and	SEn2. Energy efficiency	SEn3. Urban planning and	SEn4. Smart buildings and	SEn5. Resources	SEn6. Environmental	SEn7. Awareness rising and	SPe1. education and digital	SPe2. Research	SPe3. Creativity	SPe4. ICT - Enabled working	SPe5. Inclusive society	SLi1. Culture and leisure	SLi2. Healthcare	SLi3. Security	SLi4. Technology accessibility	SLi5. Welfare & Social	SLi6. Public spaces	SLi7. Tourism	
1	Neighborhood oasis	1				1	1	3	1				1									1	1						1				1			1								1		
2	Smarter together	1	1	1	1	1	1	6	1				1		1	1	1					1	1		1				1	1				1				1						1		
3	Energy saving license				1	1		2																				1						1	1											
4	WAALTER	1				1	1	3	1				1																			1	1				1		1	1	1	1	1			
5	TREEDAY		1		1	1		3								1																1														
6	Optimal microclimate in Aspern				1		1	2																				1	1	1															1	
7	Wien gibt raum	1	1		1		1	4		1	1			1		1		1													1														1	
8	Thematic city map "Energy"	1	1		1	1		4		1					1													1	1	1	1	1													1	
9	Wiener tafel	1	1		1	1	1	5					1				1															1						1						1		
10	Power-2-heat		1		1			2								1												1																		
11	Blockchain in the energy sector	1	1		1	1		4	1				1	1	1													1																		
12	CORE-integration center	1	1			1	1	4					1				1																		1									1		
13	Aspern Smart City research	1			1	1		3	1													1				1		1	1	1	1			1		1										
14	Pocket Mannerhatten Ottakring	1		1	1	1	1	5	1				1								1							1	1			1							1					1		
15	Wienbot	1					1	2		1																														1						
16	Smart Traffic lights			1	1			2													1					1	1	1																		
17	Temporary offices buildings at Heldenplatz		1		1			2							1	1												1	1	1	1															
18	Leila	1			1	1	1	4	1				1																				1					1				1	1			
19	Research projects unteres Hausfled		1		1	1		3										1												1						1										
20	Vienna research festival		1			1	1	3							1																															
21	Green façades in Vienna				1		1	2																				1	1	1																1
22	Future jobs		1			1	1	3								1																														
23	Co-creation lab in Vienna	1	1			1		3	1				1		1	1																														
24	thinkport Vienna	1	1	1	1			4					1												1																					
25	Energy from metro brakes		1	1	1			3														1																								
26	Samrt City Wien framework strategy monitoring	1				1		2		1				1																							1									
27	Smart Campus				1			1																				1			1															
28	Sag's wien application	1					1	2	1	1			1	1																															1	
29	ho ho vienna		1		1			2							1																															
30	Dual infiltration model		1		1			2							1																															
31	Vienesse campus model					1	1	2																																					1	1
32	ViennaGreen CO2				1			1																																						
33	Digital city wien	1						1	1	1			1	1	1																															
34	wien.at public wifi	1		1		1	1	4						1												1																				
35	hanging gardens of Oberlaa	1			1	1		3	1				1																1				1	1	1					1	1	1	1	1	1	1
36	Vienna sewer Simmerling				1			1																																						
37	Wind confort optimization at the Vienna central Station				1	1	1	3																						1															1	
38	Digital Agenda Vienna	1						1	1	1			1	1	1																															
39	LED streetlights				1			1																				1																		
40	E-government	1					1	2		1	1			1																																
41	HEAT-re-USE Vienna	1	1		1			3	1				1					1											1				1													
42	Make your city smart	1			1	1	1	4	1																							1													1	

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

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Vienna Challenges analysis (before)		1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS						4.GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
1	URBEM – DK	1	1	1	1	1	1	1															1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

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Vienna Challenges analysis (now)		1. CLIMATE CHANGE						2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS						4.GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES											
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.	
1	Neighborhood oasis	1						1	1					1		1							1		1						1													
2	Smarter together	1	1					1	1			1		1		1	1	1			1		1	1				1						1				1	1		1			
3	Energy saving license	1		1				1																																			1	
4	WAALTER	1						1	1			1											1		1													1	1				1	
5	TREEDAY	1		1			1	1																						1				1										
6	Optimal microclimate in Aspern	1		1			1	1															1		1												1		1					
7	Wien gibt raum															1			1				1		1			1		1														
8	Thematic city map "Energy"	1		1	1		1	1								1							1		1			1										1		1				
9	Wiener tafel	1		1					1	1	1					1		1					1	1	1						1	1												
10	Power-2-heat	1		1																											1	1												
11	Blockchain in the energy sector	1		1				1								1					1										1	1	1					1	1	1				
12	CORE-integration center								1			1		1	1	1	1		1				1	1	1						1	2			1									
13	Aspern Smart City research	1		1			1									1		1																				1		1				
14	Pocket Mannerhatten Ottakring	1	1	1			1	1	1	1						1	1	1			1		1		1		1	1																
15	Wienbot																						1		2													1	1				1	
16	Smart Traffic lights	1																																				1		1	1			
17	Temporary offices buildings at Heldenplatz	1		1			1	1																													1		1					
18	Leila	1		1					1							1		1					1		1																			
19	Research projects unteres Hausfled	1	1	1																																			1		1			
20	Vienna research festival								1				1										1		1					1				1				1	1					
21	Green façades in Vienna	1		1			1																																					
22	Future jobs								1	1	1		1	1									1		1						1				1			1	1					
23	Co-creation lab in Vienna															1		1													1										1			
24	thinkport Vienna	1		1																				1					1			1						1						1
25	Energy from metro brakes	1		1																																								
26	Samrt City Wien framework strategy monitoring															1				1			1	1																				
27	Smart Campus	1		1			1	1																																				
28	Sag's wien application															1	1	1	1	1			1	1	1																			
29	ho ho vienna	1		1																											1				1							1		
30	Dual infiltration model	1		1	1	1																																						
31	Vienesse campus model								1				1										1		1																			
32	ViennaGreen CO2	1		1																																			1		1			
33	Digital city wien								1	1		1		1																	1		1	1	1							1		
34	wien.at public wifi								1		1													1		1												1	1					
35	hanging gardens of Oberlaa	1		1			1		1				1			1		1																				1				1		
36	Vienna sewer Simmerling	1				1																																						
37	Wind confort optimization at the Vienna central Station	1					1																1	1	1		1											1		1				
38	Digital Agenda Vienna								1	1							1	1	1			1																1	1				1	1
39	LED streetlights	1	1	1																				1		1																		1
40	E-government																							1		1																		
41	HEAT-re-USE Vienna	1		1			1	1								1		1																					1		1			

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

42	Make your city smart	1					1	1						1		1	1	1																	1				1					
43	Mischung.possible	1	1					1	1								1	1	1	1				1		1																		
44	"klimaaktiv renewable heating programme	1															1	1	1			1													1	1	1		1					
45	Smart block step II Wien	1		1				1									1	1	1	1		1		1			1	1							1		1							
46	Smart City in public housing	1		1				1		1			1				1	1	1	1		1		1			1	1							1		1							
47	Smart services	1	1	1														1				1		1					1	1					1	1		1						
48	ICT integration Vienna Aspern	1		1																															1		1							
49	Urban learning	1	1	1	1				1								1				1	1	1	1										1		1								
50	CC-Ware	1	1	1	1												1				1						1								1									
51	wien.live. App								1			1											1		1									1	1									
52	E-taxi Vienna	1	1	1		1	1		1				1									1				1				1	1		1		1			1						
54	Wien gestalten								1	1							1	1	1	1		1				1									1									
56	drinking water power station	1		1					1								1					1	1		1																			
57	photovoltaic roof garden	1	1	1			1											1					1		1																			
58	Social city Vienna								1	1	1			1			1	1							1				1	1	1	1	1		1	1				1				
60	ecobuy vienna	1	1	1																		1		1					1	1	1						1							
63	smart from A to b	1	1	1																		1				1								1	1		1							
66	urban farming and gardening	1	1	1		1			1								1	1	1	1			1		1																			
69	EOS	1	1	1																		1		1													1							
70	The MA48Waste app	1		1			1																																					
72	Open government data																1	1	1			1													1	1								
73	CO2 neutral delivery	1	1	1				1														1	1											1				1						
74	eco business plan	1	1	1					1													1				1			1															
75	Vienna central station	1	1	1		1	1	1										1				1	1	1		1	1							1		1								
76	City bike vienna	1	1			1	1		1	1												1		1			1							1			1							
78	urban mining	1	1	1																		1												1		1								
79	Sterne	1	1	1																		1		1																				
80	STEP urban development plan 2025	1							1	1	1				1	1		1	1			1	1	1		1	1																	
81	Citizen solar powerplants	1	1	1	1											1		1				1		1		1									1		1							
	TOTAL	53	20	39	5	6	18	12	20	9	5	2	0	3	0	1	11	9	7	3	2	8	2	22	4	17	0	5	5	1	5	3	5	3	3	2	2	2	18	8	10	4	4	2
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.
Vienna Challenges analysis (now)		1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS							4.GLOBAL URBANIZATION							5. ECONOMIC INSTABILITY							6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES							

Annex 3: Analysis of initiatives: Milan

A3. 1. Milan stakeholders' opinions

A3. 1.1. Milan stakeholders' opinions: other stakeholders

A3. 1.2. Milan stakeholders' opinions: challenges

A3. 2. Milan implementation analysis

A3. 2.1. Milan implementation analysis: stakeholders (before and now)

A3. 2.2. Milan implementation analysis: projects (before and now)

A3. 2.3. Milan implementation analysis: challenges (before and now)

A3. 1. Milan stakeholders' opinions

A3. 1.1. Milan stakeholders' opinions: stakeholders

	municipality	university	companies	civil society
	Lucia Scopelletti-Smart City office	Alberto Coloni-poliedra	a2a-Palazzoli	Damiano di Simine, legambiente
		Grazia Conciglio-politecnico: co-design		
		0 and participation	Cisco-Andrea Vilani	0
Eugenio Morello		0 Donatela Sciutto: rector delegate for ICT		0
	town council		0	0
	regional council		0 AMSA	0
Afonso Fugetta	services for the territories		0	0
				Fuori salone actors: full of activists and citizen professionals, who are the real experts a, the technical professionals, consultancy of the municipal actors
	Tajani		0 Avanzi	
	renato galliano		0	0 Stefano maffei
	assessore Cocco (open gov and ICT)		0	0 individuals, ephemeral groups
	Lipparini			0
Grazia Conciglio	Granelli (mobility)			
	Public companies: ATM			Legambiente: environmental civic association
	Public companies: milan ristorazione			Camera del comrcio
	Public companies: Milano Sport			Association of transprot (ALSED)
	Piero Pelizzaro			Asolombardia
	Granelly (deputy mayor)			Gelists (FIAB) asocieton of vendors
Valentino Sevino	Salucci (mobility department director)			
	municipalities		Big private companies	0
Alberto Coloni-Poliedra	Public agencies like AMAT		0 a2a	0
	Politicians: continuity or choice, political continuity in management. Cristina Tajani. Roberta Cocco. Liparini. Amat.		cefriel	Citizens (big difference in Milan, sharing and collaborative approach.
Piero Pelizzaro		0 Politecnico di Milano.		0 Big foundations, donnors like Cariplo
Fabio Scaragli		0 Center for social innovation		0
Milly moratti	Diego piazzentini (Open government)			

Stefano quintarelli (digital agenda)				
Constantino Bongiorno	Tajani			Milano IN asociation
	local government			Fondazione Cariplo
				networks of people
Matteo Bartolomeo				coworking spaces
	Office of public municipality	dept. of management: Calderini.	prof. Morandi, of planning: Smart Territories.	
	Renato galliano			
	Cristina Tajani	Eugenio Morello.	Sharing project	
		Profesor capitani, consultatn at the Smart City		
Gabrielle Pasqui	The 9 local municipalities	0	0	Producers organizations
				Building (constructors)
	0	0	0	sindicate
				Catholic organizations (capacity to make economy into circular economy: recycling materials
	0	0	0	
	0	0	0	co-hosing organizations
	0	0	0	organizations of consumers
	0	0	0	bicile repairesr (informal network of cyclists)
Damiano di Simine	0	0	0	environmental NGO's
Pierpaolo Palazzoli	Municipal administrations	utilities		Confindustria
Guido Albertini		telecommunications operators		
		Traditional business		
		new business		
		taxis		
		uber		
Pierfrancesco Maran		air bnb		
		hotels		
TOTAL	28	10	16	24

A3. 1.2. Milan stakeholders' opinions: challenges

		Eugenio Morello	Grazia Conciglio	Afonso Fugetta	Valentino Sevinio	Alberto Colomi	Piero Pelizzaro	Fabio Scaragli	Milly moratti	Constantino	Matteo Bartolomeo	Gabrielle Pasqui	Damiano di Simine	Pierpaolo Palazzoli	Guido Albertini	Pierfrancesco Maran	
global trends	Climate Change	4	5	1	5	5	3			2	1	4	5	3		5	3,5
	Social Polarization	3	5	5	4	2	5			4	5	3	4	3		3	4,0
	Need for new governance models	5	5	4	4	4	3			4	2	4	3	4		2	3,8
	Global urbanization	1	4	4	5	3	4			2	1	3	3	2		4	3,0
	Economic instability	2	3	3	4	3	5			3	3	2	3	5		3	3,1
	Technology driven approaches to urban issues	3	1	4	5	4	4			4	2	3	2	5		5	3,2
challenges	Reducing ecological footprint and pressure over ecosystems, fostering ecological functions of land	4	5	5	5	4	4			3	3	5	5	3		5	4,3
	Implementing and coordinating new technologies for energy saving and emission reductions through planning and governance tools	4	3	5	4	4	4			4	4	4	4	4		4	4,0
	Managing adaptation to innovation and knowledge based economies while providing solutions to a broad skill base	3	4	4	4	4	5			5	4	3	3	4		3	4,0
	Improving effectiveness of institutions, coordination among public bodies and multilevel governance (leading to more integrated sectoral policies)	5	5	4	5	3	4			4	4	5	4	3		3	4,3
	Promoting equity in access to labour market and conciliation of work and family life	5	5	3	5	4	5			3	4	3	5	3		4	4,5
	Implementing a holistic approach to environmental issues	5	5	4	5	3	4			3	4	4	3	3		4	4,0
	Fostering social inclusion and cohesion	5	5	4	4	4	5			4	5	4	4	4		3	4,4
	Increasing efficiency in resources management (energy, water, etc) and circular economy	4	5	4	5	4	5			3	2	4	5	5		5	4,1
	Articulating mobility planning tools and policies with innovations in the sector	2	4	4	5	5	4			4	2	5	3	5		4	3,8
	Fostering human and social capital as source of innovation	3		4	5	3				5	4	3	2	4		3	3,6
	Fostering sustainable accessibility in cities and promoting sustainable, inclusive and healthy mobility when needed	2	4	5	5	4	5			4	3	2	5	4		4	4,2
	Eradicating spatial exclusion and promoting equity in access to housing and quality urban environments	4	5	4	4	3	5			3	5	4	4	3		3	4,2
	Enhancing social diversity as a dynamic asset	2	5	3	4	3	4			4	5	3	3	3		2	3,5
	Shifting to more participative and inclusive democracy	3	5	3	5	4	4			4	4	3	2	2		2	3,7
	Enhancing equity within society	4	5	4	5	5	4			3	5	3	4	2		2	4,2
	Developing a coordinated Climate Change mitigation strategy	5	5	2	5	5	3			3	2	4	5	3		4	3,8

Fostering resilience of cities regarding climate change and disasters risks	4	5	2	5	3	5				2	2	4	5	4		5	3,5
Reducing externalities of new technologies implementation (i.e. cybersecurity)	3	3	4	5	4	3			2	2	2	2	5			3	3,0
Enhancing territorial cohesion	2		3	5	3	4			4	4	2	4	3			2	3,4
Managing urban population growth while reducing negative externalities	1	4	4	5	4	3			3	1	1	5	4			2	3,1
Fostering citizenship urban cocreation and comanagement combining top-down and bottom-up models	4	4	2	4	4	4			5	4	4	2	3			3	3,7
Strengthening inclusion of migrants and refugees	3	4	4	5	4	5			4	5	5	5	3			4	4,4
Adapting the city economic and social life to ageing population while attracting young and children	5	4	5	5	4	3			5	5	5	4	5			3	4,5
Developing eco-friendly urban environments and answering to growing environmental concerns	5	4	5	5	4	3			3	2	4	3	3			3	3,8
Balancing urban growth and territorial development (urban-rural balance management)	3	5	5	5	4	4			3	3	3	5	3			2	4,0
Improving resiliency of economic systems and adaptation to changes in global and local economies	5	4	5	5	4	5			4	3	4	3	4			3	4,2
Maintaining quality of life in cities assuring access to services according to changes in demand (education, health, culture, safety, etc)	5	2	5	5	3	4			5	4	4	4	4			5	4,1
Increasing flexibility and resiliency of governance models	4	4	4	4	3	2			5	4	3	3	3			3	3,6
Fostering technological innovation driven by social and human capital	3	3	4	4	4	5			5	3	2	2	4			2	3,5
Enhancing integration in global economies promoting cooperation among cities and territories	2	3	3	5	3	4			5	3	2	2	3			2	3,2
Fostering employment creation with high quality standards	4	4	5	5	3	5			4	4	4	3	4			4	4,1
Achieving balance between competitiveness and quality of life	4	3	5	5	3	4			4	4	4	4	5			4	4,0
Enhancing adaptation of society, governance and economy to transformations through ICT	3	2	5	5	3	5			5	1	3	2	5			3	3,6
Improving sustainability and diversity of local economies in balance with cities specialization	2	3	4	5	4	4			5	2	1	3	3			2	3,6
Fostering interurban variety and cities willingness and protecting cultural heritage	2	2	4	5	4	5			4	4	3	4	3			2	3,7
Developing new planning tools for sustainable development (less urban sprawl, policentric plans, increased density and diversity, mixed land use, urban refurbishment...)	2	5	3	5	4	4			4	4	4	5	2			3	4,0
Incorporating and regulating innovative management systems at local level while improving capacity building (ie. PPP or PPPP, e-governance, etc)	4	4	2	4	4	4			5	4	4	3	4			3	3,8

A3. 2. Milan implementation analysis

A3. 2.1. Milan implementation analysis: stakeholders

N.	Smart City projects (before)	Involved stakeholders	Stakeholders' type
1	MIUR-S[m2]ART	ATI (ASTREL, H&S, DIMENSIONE SOLARE, WINEXT, NERIWOLFF)	company
		GRUPPO THEMA PROGETTI	company
		METALCO	company
		REPLY	company
		TIM (TELECOM ITALIA)	company
		POLITECNICO DI MILANO	knowledge
		POLITECNICO DI TORINO	knowledge
		comune di milano	local government
		A.T.I COSTITUENDA TRA LE PMI: FIT CONSULTING SRL, ITALDATA SPA E TEMA – TERRITORIO	company
		IVECO SPA	company
2	MIUR-URBe-LOG	MOBILITÀ AMBIENTE SRL	company
		SELEX ES SPA	company
		TELECOM ITALIA SPA	company
		TNT SPA	company
		POLITECNICO DI TORINO	knowledge
		SCUOLA SUPERIONE SANT'ANNA	knowledge
		UNIVERSITÀ COMMERCIALE LUIGI BOCCONI	knowledge
		comune di Milano	local government
		ASSIOMA.NET	company
		ITALTEL	company
3	MIUR-DECISION THEATRE	NEXTAGE	company
		NIS S.R.L	company
		SEAC02	company
		SELEX ES	company
		TELECOM ITALIA	company
		POLITECNICO DI TORINO – DAUIN, DET, DISAT	knowledge
		UNIBICOCCA - CRISP	knowledge
		UNIVERSITÀ DI GENOVA – DIME	knowledge
		comune di Milano	local government
		TRA	public company
4	MIUR-PSC GIUSTIZIA	FONDAZIONE POLITECNICO DI MILANO	civil society

		5 EMME INFORMATICA S.R.L.	company
		ALCATEL LUCENT S.P.A.	company
		EASYGOV SOLUTIONS S.R.L.	company
		LINKS MANAGEMENT AND TECHNOLOGY S.P.A.	company
		PENELOPE S.P.A.	company
		PROGESI S.P.A.	company
		SELEX ES S.P.A.	company
		TELECOM ITALIA S.P.A.	company
		DIG (POLITECNICO DI MILANO)	knosledge
		DATSU (POLITECNICO DI MILANO)	knowledge
		DEIB (POLITECNICO DI MILANO)	knowledge
		UNIDATA S.P.A.	knowledge
		comune di Milano	local government
		OMINTECH	company
		SWARM-NET ATI	company
		TELECOM	company
		VITROCISSET	company
		METROPOLITANA MILANESE	government
		CNR	knowledge
		POLITECNICO DI MILANO	knowledge
		UNIVERSITÀ DI MILANO BICOCCA E BRESCIA	knowledge
		comune di Milano	local government
		ADB Broadband S.p.A.	company
		COSTER T.E. S.p.A.	company
		CPL CONCORDIA Soc. Coop.	company
		Eclipse Italia S.r.l.	company
		Energe S.r.l.	company
		GFM-Net S.r.l.	company
		LU-VE S.p.A.	company
		SIEL S.p.A.	company
		Thytronic S.p.A.	company
		Università degli Studi di Brescia	company
		Italdata S.p.A.	comppany
		Politecnico di Milano	knowledge
		comune di Milano	local government
		A2A S.p.A.	public company
		AMC Service	company
		Engitel	company
		Reitek	company
		Sibyl	company
7	POR-SPAC3	Vidiemme consultino	company

	Visiant	company
	Università Milano Bicocca	knowledge
	Comune di Bergamo	local government
	comune di Milano	local government
	Cefriel	public company
	Astir	company
	BrianTel	company
	Epson-meteo	company
	Galileian Plus	company
	Informatica Ambientale	company
	Mixel	company
	Nier	company
	TerrAria	company
	M.M. Metropolinata Milanese	government
	CNR-IDPA	knowledge
	EUCENTRE	knowledge
	comune di milano	local government
	A.T.M.	local public company
8 POR-SIMULATOR	CEFRIEL	public company
	Acs Dobfar S.P.A.	company
	Alan S.R.L.	company
	Austep S.P.A.	company
	Consorzio Italbiotec	company
	Labanalysis S.R.L.	company
	Politecnico Di Milano	knowledge
	Universita' Degli Studi Di Milano	knowledge
POR-CITY-WISE-	comune di Milano	local government
9 NET	Consorzio Milano Ricerche	company
	Italdata	company
	Muoversi	company
	Project Automation (Capofila)	company
	Poliedra-Politecnico di Milano	knowledge
	Università Milano Bicocca	knowledge
10 POR-OPTI-LOG	comune di Milano	local government
	Gulliver	company
	Me-source/ Blogmeter	company
	Società Sensoristica	company
	Vodafone	company
	WebRatio	company
	Polimi	knowledge
	comune di milano	local government
11 POR-PROACTIVE	Cefriel	public company
	Consorzio Remedia	company
12 POR-E-WASTE	Gruppo Gaser	company

		Gruppo Stena Metall	company
		SEVAL	company
		Tecnochimica	company
		Politecnico di Milano	knowledge
		comune di Milano	local government
		AMSA	localpublic company
		Cefriel	public company
		IMAGINARY	civil society
		IRCCS DON GNOCCHI	civil society
		AB TREMILA	company
		ASTIR	company
		SECUREnETWORK	company
		TELBIO	company
		TEOREMA	company
		POLIMI	knowledge
		UNIVERSITÀ BICOCCA	knowledge
13	POR-ABILITY	comune di milano	local government
		video & geospatial	-
		IRCCS E. Medea	civil society
		Aeris Cooperativa Sociale	company
		Didael KTS Knowledge technologies services	company
		MR&D Innovation partner	company
		Scube Newmedia - Information access,	company
		SlxS Soluzioni informatiche per il sociale	company
		Telecom Italia	company
		Politecnico di Milano	knowledge
		Università degli studi Milano-Bicocca	knowledge
14	POR-GIOCO	comune di milano	local government
15	area c	comune di milano	local government
		FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	knowledge
		UNI WERSYTET GDANSKI	knowledge
		WUPPERTAL INSTITUT FUR KLIMA, UMWELT, ENERGIE GMBH	knowledge
		READING BOROUGH COUNCIL	local governemnt
		GEMEENTE ROTTERDAM	local governemnt
		AYUNTAMIENTO DE DONOSTIA SAN SEBASTIAN	local governemnt
		BKK BUDAPESTI KOZLEKEDESI KOZPONT ZARTKORUEN MUKODO	local governemnt
	TIDE (transprot innovation deployment for europe) preferenza semaforica	RESZVENYTARSASAG	company
		comune di milano	local government
16		EUROCITIES ASBL	local government
17		comune di milano	local government

			Clear cHannel	company
			comune di milano	local government
SE-bike	18	BIKEMI	sharing	
			ATM (Azienda Trasporti Milanese)	localpublic company
			Demonstration site candidates and local partners	-
			European cities and regions networking for innovative transport solutions (POLIS BE)	civil society
			Metropolia	civil society
			2GetThere Sustainable Mobility Solutions (2GetThere)	company
			Anaptyxiaki Etaireia Dimou Triikkaion Anaptyxiaki Anonymi Etaireia Ota (e-Trikala EL)	company
			ARST SpA	company
			Automated Road Transport System suppliers	company
			Click Utility Srl	company
			EasyMile	company
			Ingegneria dei Trasporti Srl (ITR IT)	company
			NOVADAYS S.L	company
			Proxiway	company
			Robosoft advanced robotic solutions (Robosoft)	company
			STRATEC	company
			Systematica	company
			Urban Buses of León S.A.U. (ALESA ES)	company
			VisLab - machine vision algorithms and intelligent systems (Italy)	company
			ZurichZurich Insurance Group (Zurich CH)	company
			European Road Transport Telematics Implementation Coordination Organisation (ERTICO BE)	government
			Institute of Studies for the integration of Systems (ISIS IT)	government
			Region de Bruxelles Capital – Admin de l'Equipement et des Déplacements	government
			Finnish Transport Agency	government
			Centro di Ricerca sul Trasporto e la Logistica Sapienza University of Rome (CTL IT)	knowledge
			Ecole d'Ingénieurs généralistes La Rochelle (EIGSI FR)	knowledge
19	ClinSC-City mobil 2		European Organisation for Nuclear Research (CERN CH)	knowledge

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

	Fundación Tecnia Research & Innovation (Tecnalia)	knowledge
	German Aerospace Centre (DLR DE)	knowledge
	Groupe d'Etudes en Aménagement, Vallotton et Chanard SA (GEA CH)	knowledge
	Institut National de Recherche en Informatique et Automatique (INRIA FR)	knowledge
	Institute for transport studies University of Leeds (ITS UK)	knowledge
	Institute of Communication and Computer Systems (ICCS EL)	knowledge
	MLab	knowledge
	Spanish National Institute for Aerospace Technology (INTA ES)	knowledge
	Swiss Federal Institute of Technology Lausanne (EPFL CH)	knowledge
	Transportation Research Group University of Southampton (TRG UK)	knowledge
	Vantaa Innovation Institute Ltd	knowledge
	Ayuntamiento de León	local government
	Communauté d'Agglomération de La Rochelle	local government
	Communauté d'Agglomération Sophia Antipolis (CASA FR)	local government
	Commune de Saint Sulpice	local government
	Comune di Milano	local government
	Comune di Oristano	local government
	Trafi	local government
	Vantaa	local government
	Ville de La Rochelle	local government
	Helsinki Regional Transport Authority	public company
20	guidami	comune di milano
21	infopaline	comune di milano
22	portali della mobilità e infoalert	comune di milano
23	indirizzamento di parcheggi	comune di milano
	BEE	company
	Consorzio buenos aires	company
	DHL	company
	Ducati Energia	company
	EXPO milano 2015	company
	Internet Explorer	company
24	LINK-SE-Isole Digitali	linear

		TIM	company
		FESR	government
		Comune di Milano	local government
		Comune di Milano	local government
		a2a	public company
25	converse	comune di milano	local government
		Green Building council	civil society
		alpS	company
		C-consulenti	company
		Synergi.KOMM	company
		Rockwool	company
		Wolf Artec	company
		VTT technical Research Centre of Finland	knowledge
		Sverigestechnike Forksinstitut SP	knowledge
		Technical research centre of Slovakia	knowledge
		Politecnico di Milano	knowledge
		BOKU-University of natural resources and life sciences	knowledge
		National Renewable energy centre CENER	knowledge
		City of Gothenbourg	local government
		City of Vienna	local government
		City of Tampere	local government
		Gazantiep Metropolitan Municipality	local government
		City of Aachen	local government
		Gewoge AG Aachen	local government
		City of Milan	local government
		STAWAAG Stadtwerke Aachen	local government company
		AMAT	local government company
		City of Bratislava	local government
		Sestao Berri 2010	local government company
		ALER MILANO	public company
26	ClinSC-PE-FR-Evue	Ente Vasco e la energia	public company
27	aree carico scarico	comune di milano	local government
28	merci pericolosi	comune di milano	local government
29	infomobilita per la citta di milano	comune di milano	local government
30	ticketing payment	comune di milano	local government
31	fare impresa	comune di milano	local government
32	iride	comune di milano	local government
33	E015	comune di milano	local government

	International Centre for Numerical Methods in Engineering	civil society
	Istanbul Sports Events Inc	civil society
	Leicester Energy Agency (LEA)	civil society
	Lyonnaise des Eaux	civil society
	Milan City Council	civil society
	Belit ICT Company	company
	BT	company
	Cisco	company
	EDF Optimal Solutions	company
	Empírica	company
	envi Engineer and Consulting Company GmbH	company
	Moulins Habitat	company
	Real Project Partner	company
	RSM Gassó Cimne Energy, sl (INERGY)	company
	SystemsLink	company
	De Montfort University	knowledge
	The Faculty of Mechanical Engineering University Belgrade	knowledge
	ALEM	knowlege
	Bristol City Council	local government
	Birmingham City Council	local government
	city of Hagen	local government
	City of Venlo	local government
34	ClinSC-smart spaces town of Moulins	local government
34	ClinSC-smart spaces Beogradske elektrane	localpublic company
35	ClinSC-PE-EUGUGLE	
36	cestino intelligente comune di milano	local government
37	smart IP comune di milano	local government
38	DOMO GRID comune di milano	local government
39	Piano di teleriscladamento comune di milano	local government
40	MET (museo esteso nel territorio) comune di milano	local government
41	Musei.net comune di milano	local government
42	MiTo comune di milano	local government
43	Media Librari on line comune di milano	local government
44	Servizi online comune di milano	local government
45	DigitaMI comune di milano	local government
46	app eventi comune di milano	local government
47	app guida milano comune di milano	local government
48	mobile QR code comune di milano	local government
49	Portale turismo comune di milano	local government

50	LIA (libro italiano accessibile	comune di milano	local government
51	autoprestito RFID	comune di milano	local government
52	Real IT	comune di milano	local government
		Alfamicros Sistemas de Computadores	local government
		Comune di Aalborg	local government
		Comune di Birmingham	local government
		Comune di Lisbona	local government
53	ClinSC-my neighbourhood my city	Comune di Milano	local government
54	Mappatura delle reti informali	comune di milano	local government
		eppela	company
		Comune di milano - Politiche del lavoro, Sviluppo economico, Università e ricerca	local government
55	CROWDFUNDING	Comune di milano - Politiche Sociali e Cultura della Salute	local government
56	centro per le migrazioni	comune di milano	local government
57	carta identità sociale	comune di milano	local government
58	punt sociali	comune di milano	local government
59	agenzia uni	comune di milano	local government
60	ambrogio	comune di milano	local government
61	multa semplice	comune di milano	local government
62	LINK-SE-WI-fi area		local government
63	anziani piu coinvolti e piu sicuri	comune di milano	local government
64	smart ciber	comune di milano	local government
65	messa in rete delle istituzioni del welfare	comune di milano	local government
66	semplifica mi	comune di milano	local government
67	caronte	comune di milano	local government
68	icaro	comune di milano	local government
69	geo school	comune di milano	local government
70	piano dei tempi e degli orari	comune di milano	local government
71	genitori i video	comune di milano	local government
72	PMUS	comune di milano	local government
73	PUGGS	comune di milano	local government
74	PGTe NIL	comune di milano	local government
75	link-SE-Open data	Presidenta Commissione Partecipazione - Iniziativa Popolare - Open Data e vicepresidente Commissione Innovazione - Trasparenza - Agenda Digitale - Stato Civile	local government
76	Nuovo portal insittuzionlae	comune di milano	local government
77	MOC-main operation center	comune di milano	local government

No.	Smart City Projects (now)	Involved Entities	type of stakeholder
<	sc-NETWORK DI INCUBATORI	Comune di milano - Politiche del lavoro, Sviluppo economico, Università e ricerca	local government
2	SC-INC-SMART CITY LAB	Comune di milano - Politiche del lavoro, Sviluppo economico, Università e ricerca	
3	MILANO IN	Comune di milano - Politiche del lavoro, Sviluppo economico, Università e ricerca	local government
4	INNOVAZIONE SOZIALE - FABRIQ	Fondazione Giacomo Brodolini	civil society
		Impact Hub Milano	company
		Comune di Milano	local government
		ANCI (Associazione Nazionale dei Comuni Italiani)	civil society
		BASE (partenariato tra Arci Milano, Avanzi, esterni, h+ e Make a Cube3.)	civil society
		FabriQ (costituito dall'unione delle competenze di Fondazione Brodolini e di Impact Hub Milano)	civil socitey
		Agenzia Nazionale per i Giovani (ANG)	government
		Istituto per la Finanza e l'Economia Locale (IFEL)	local government
5	Milan young Citizens	L'Assessorato alle Politiche per il lavoro, Sviluppo economico, Università e Ricerca del Comune di Milano	local government
6	BOOSTINNO	Bocconi University	knowledge
		Fondazione Politecnico di Milano	civil society
		Legambiente Onlus	civil society
		Future Energy	company
		Kiunsys S.r.l	company
		NHP S.r.l,	company
		Selene	company
		Siemens Spa.	company
		Teicos UE S.r.l	company
		Politecnico di Milano-Poliedra	knowledge
		Ricerca sul Sistema Energetico (RSE SPA)	knowledge
		Comune di Milano	local government
		AMAT	localpublic company
		ATM (Azienda Transporti Milanese	localpublic company
		A2A Reti Elettriche	public company
		A2A S.p.A.	public company
7	Sharing cities	Cefriel	public company

	WeMake	civil society
	Edgeryders? If they have somebody in milan	company
8 Open Care	Comune di Milano	local government
	eppela	company
	Comune di milano - Politiche del lavoro, Sviluppo economico, Università e ricerca	local government
9 CROWDFUNDING	Comune di milano - Politiche Sociali e Cultura della Salute	local government
	ALTROCONSUMO (Associazione)	civil society
	FONDAZIONE DAR ~ CESARE SCARPONI O.N.L.U.S.	civil society
	FONDAZIONE HOUSING SOCIALE	civil society
	FONDAZIONE POLITECNICO MILANO	civil society
	FONDAZIONE R.C.M. ~ RETE CIVICA MILANESE	civil society
	LA CORDATA (Società Cooperativa Sociale O.N.L.U.S.)	civil society
	REPLACE (Associazione)	civil society
	SOCIAL STREET DI VIA MAIOCCHI (a Milano)	civil society
	WELCOME PACK	civil society
	AGATA S.P.A. ~ PRESTIAMOCI	company
	AIRBNB ITALY S.R.L.	company
	BE SMART S.R.L.	company
	BLA BLA CAR ITALIA	company
	BNB SITTER S.A.S.	company
	BOOKABOOK	company
	BUY ZERO	company
	BYKE S.R.L.	company
	CIAOEAT	company
	COMIECO	company
	CONSORZIO SIR ~ SOLIDARIETA' IN RETE	company
	COOPERACY	company
	COWO ~ COWORKING PROJECT	company
	COWORKING LOGIN ~ ENTER S.R.L.	company
	DEREV S.R.L.	company
	DORISSETTE S.R.L.	company
	EUDAIMON S.R.L.	company
	FUSEDROPS S.R.L.	company
	GUIDE ME RIGHT ~ YOUR LOCAL FRIEND EVERYWHERE	company
10 SHARING ECONOMY-operators	HÈLIOS S.N.C.	company

	IMPACT HUB MILANO ~ THE HUB S.R.L.	company
	INVENTO INNOVATION LAB S.R.L.	company
	JOINTLY, IL WELFARE CONDIVISO S.R.L.	company
	LAST MINUTE SOTTO CASA (L.M.S.C.) ~ PERCHE' IL CIBO... NON SI BUTTA!	company
	LOCLOC S.R.L.	company
	MAKE IT APP	company
	MARE S.R.L.	company
	MYHOMING S.R.L.	company
	OLTRE VENTURE S.R.L.	company
	OXWAY	company
	PACO DESIGN COLLABORATIVE	company
	PETME S.R.L.	company
	PIANO C S.R.L. e PIANO C (Associazione)	company
	REGUS BUSINESS CENTRES ITALIA S.R.L.	company
	RIGHT HUB S.R.L.	company
	SAVE BY BOOKING S.R.L.	company
	SHARE THE CITY S.R.L. ~ LETZGO	company
	STRAPPO	company
	THE FABLAB S.R.L.	company
	TIME REPUBLIK S.A.	company
	TO BE COMPETITIVE S.R.L.	company
	USEIT S.R.L.	company
	WHAT A SPACE S.R.L.	company
	WIKIMEDIA ITALIA	company
	X4U ~ EXPERIENCE FOR YOU	company
	ZOOPPA EUROPE S.R.L.	company
	UIDU	company? Civil society?
	HOUZZ	compnau
	Associazione Collaboriamo (capofila)	civil society
	Associazione Welcomepack	civil society
11 SHARING ECONOMY-COHUB	Fidia s.r.l.	company
	comune di milano	local government
12 NYC-milan business exchange	NYCEDC (New York City Economic Development Corporation)	local public company
	BEE	company
	Consorzio buenos aires	company
13 LINK-SE-Isole Digitali	DHL	company

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

	Ducati Energia	company
	EXPO milano 2015	company
	Internet Explorer	company
	linear	company
	TIM	company
	FESR	government
	Comune di Milano	local government
	Comune di Milano	local government
	a2a	public company
14 link-SE-Open data	Presidenta Commissione Partecipazione - Iniziativa Popolare - Open Data e vicepresidenta Commissione Innovazione - Trasparenza - Agenda Digitale - Stato Civile	local government
15 LINK-SE-WI-fi area		local government
16 SE-bando makerspaces-fablabs-comune dimilano	comune di milano	local government
17 SE-bando coworking-camera di commercio	Camera di Commercio di Milano	civil society
	Fondazione Giacomo Brodolini (Mandataria)	civil society
	ITALIACAMP srl (Mandante)	company
18 SE-INC-Incubatora d'azeglio	LUISS Guido Carli (Mandante).	knowlege
	Clear cHannel	company
	comune di milano	local government
19 SE-bike sharing BIKEMI	ATM (Azienda Trasporti Milanese)	localpublic company
	BASE (partenariato tra Arci Milano, Avanzi, esterni, h+ e Make a Cube3.)	civil society
	comune di milano	local government
20 SE-INC-spazio ex Anslado	MUDEC (musseo delle culture)	local government
21 SE-Spazi inutilizzati	comune di milano	local government
	ARCI	civil society
	Camera di Commercio di Milano	civil society
	dar: costruire solidarieta	civil society
22 SE-allogi ospedale solidale	cooperativa comunita progetto	company
	APS Comitato Ponti	civil society
	APS Conchetta Verde	civil society
	APS Giardino delle Culture	civil society
	APS Terra Rinata	civil society
	Associazione Parco Segantini ONLUS	civil society
	Associazione: APS Giardini in Transito	civil society
	Legambiente Milano	civil society
	Movimento per la Decrescita Felice	civil society
23 SE-giardini condivisi	9 per 9 Idee in Rete	company

24	SE-tira su la cler	comune di milano	local government
25	INCUBATORI-Polihub	politecnico di Milano	knowledge
		Camera di Commercio di Milano	civil society
		università bocconi	knowledge
26	INC-SpedMiUp	comune di milano	local government
		Ipad Lab	company
		ISTA	company
		Italbiotec	company
		Italbugs	company
		Urbano l'Hub	company
		BiCT	knowledge
		Flowmetric EU	knowledge
27	INC-Parco tecnologico Padano	Gruppo Ricicla	knowledge
28	INC-LEM*, Maker Space	comune di milano (azeglio)	local government
29	INC-Arte e Messaggio	comune di milano	local government
30	INC-Centro Quarenghi	comune di milano	local government
		MOBILITÀ AMBIENTE SRL	company
		POLITECNICO DI TORINO	knowledge
		SCUOLA SUPERIONE SANT'ANNA	knowledge
		SELEX ES SPA	company
		TELECOM ITALIA SPA	company
		TNT SPA	company
		UNIVERSITÀ COMMERCIALE LUIGI BOCCONI	knowledge
31	MIUR-URBe-LOG	A.T.I COSTITUENDA TRA LE PMI: FIT CONSULTING SRL, ITALDATA SPA E TEMA – TERRITORIO	company
		Consorzio Milano Ricerche	company
		Italdata	company
		Muoversi	company
		Project Automation (Capofila)	company
		Poliedra-Politecnico di Milano	knowledge
		Università Milano Bicocca	knowledge
32	POR-OPTI-LOG	comune di Milano	local government
		comune di Milano	local government
		OMINTECH	company
		SWARM-NET ATI	company
		TELECOM	company
		VITROCISET	company
		IVECO SPA	company
		METROPOLITANA MILANESE	government
		CNR	knowledge
33	MIUR-SWaRM-Net	POLITECNICO DI MILANO	knowledge

		UNIVERSITÀ DI MILANO	knowledge
		BICOCCA E BRESCIA	
		comune di Milano	local government
		ADB Broadband S.p.A.	company
		COSTER T.E. S.p.A.	company
		CPL CONCORDIA Soc. Coop.	company
		Eclipse Italia S.r.l.	company
		Energe S.r.l.	company
		GFM-Net S.r.l.	company
		LU-VE S.p.A.	company
		SIEL S.p.A.	company
		Thytronic S.p.A.	company
		Università degli Studi di Brescia	company
		Italdada S.p.A.	company
34	POR-SCUOLA -smart campus as urban open labs	Politecnico di Milano	knowledge
		comune di Milano	local government
		A2A S.p.A.	public company
		Acs Dobfar S.P.A.	company
		Alan S.R.L.	company
		Austep S.P.A.	company
		Consorzio Italbiotec	company
		Labanalysis S.R.L.	company
		Politecnico Di Milano	knowledge
		Universita' Degli Studi Di Milano	knowledge
35	POR-CITY-WISE-NET	comune di Milano	local government
		Consorzio Remedia	company
		Gruppo Gaser	company
		Gruppo Stena Metall	company
		SEVAL	company
		Tecnchimica	company
		Politecnico di Milano	knowledge
		comune di Milano	local government
		AMSA	localpublic company
36	POR-E-WASTE	Cefriel	public company
		ASSIOMA.NET	company
		ITALTEL	company
		NEXTAGE	company
		NIS S.R.L.	company
		SEAC02	company
		SELEX ES	company
		TELECOM ITALIA	company
		POLITECNICO DI TORINO – DAUIN, DET, DISAT	knowledge
		UNIBICOCCA - CRISP	knowledge
37	MIUR-DECISION THEATRE	UNIVERSITÀ DI GENOVA – DIME	knowledge

	comune di Milano	local government
	TRA	public company
	FONDAZIONE POLITECNICO DI MILANO	civil society
	5 EMME INFORMATICA S.R.L.	company
	ALCATEL LUCENT S.P.A.	company
	EASYGOV SOLUTIONS S.R.L.	company
	LINKS MANAGEMENT AND TECHNOLOGY S.P.A.	company
	PENELOPE S.P.A.	company
	PROGESI S.P.A.	company
	SELEX ES S.P.A.	company
	TELECOM ITALIA S.P.A.	company
	DIG (POLITECNICO DI MILANO)	knowledge
	DATSU (POLITECNICO DI MILANO)	knowledge
	DEIB (POLITECNICO DI MILANO)	knowledge
	UNIDATA S.P.A.	knowledge
38 MIUR-PSC GIUSTIZIA	comune di Milano	local government
	AMC Service	company
	Engitel	company
	Reitek	company
	Sibyl	company
	Vidiemme consultino	company
	Visiant	company
	Università Milano Bicocca	knowledge
	Comune di Bergamo	local government
39 POR-SPAC3	comune di Milano	local government
	Cefriel	public company
	ATI (ASTREL, H&S, DIMENSIONE SOLARE, WINEXT, NERIWOLFF)	company
	GRUPPO THEMA PROGETTI	company
	METALCO	company
	REPLY	company
	TIM (TELECOM ITALIA)	company
	POLITECNICO DI MILANO	knowledge
	POLITECNICO DI TORINO	knowledge
40 MIUR-S[m2]ART	comune di milano	local government
	IMAGINARY	civil society
	IRCCS DON GNOCCHI	civil society
	AB TREMILA	company
	ASTIR	company
41 POR-ABILITY	SECUREnETWORK	company

	TELBIOS	company
	TEOREMA	company
	POLIMI	knowledge
	UNIVERSITÀ BICOCCA	knowledge
	comune di milano	local government
	video & geospatial	-
	IRCCS E. Medea	civil society
	Aeris Cooperativa Sociale	company
	Didael KTS Knowledge technologies services	company
	MR&D Innovation partner	company
	Scube Newmedia - Information access,	company
	SIxS Soluzioni informatiche per il sociale	company
	Telecom Italia	company
	Politecnico di Milano	knowledge
	Unversità degli studi Milano-Bicocca	knowledge
42 POR-GIOCOLO	comune di milano	local government
43 POR-PROACTIVE	Gulliver	company
	Me-source/ Blogmeter	company
	Società Sensoristica	company
	Vodafone	company
	WebRatio	company
	Polimi	knowledge
	comune di milano	local government
	Cefriel	public company
	Astir	company
	BrianTel	company
	Epson-meteo	company
	Galileian Plus	company
	Informatica Ambientale	company
	Mixel	company
	Nier	company
	TerrAria	company
	M.M. Metropolinata Milanese	government
	CNR-IDPA	knowledge
	EUCENTRE	knowlege
44 POR-SIMULATOR	comune di milano	local government
	A.T.M.	local public company
	CEFRIEL	public company

Milan projects analysis
(before)

Milan projects analysis (before)		DIMENSIONS																																														
		Smart Governance				Smart Economy				Smart Mobility				Smart Environment				Smart People				Smart Living																										
		PROJECT ACTIONS																																														
		gov	eco	mob	env	peo	liv	TOTAL	SGo1. Participation	SGo2. Transparency and	SGo3. Public and Social Services	SGo4. Multi-level governance	SGo5. Community building and	SGo6. Efficiency in municipal	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global	SEc4. Productivity	SEc5. Flexibility and conciliation in	SMo1. Accessibility	SMo2. Clean, non-motorised	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and environmental	SEn2. Energy efficiency	SEn3. Urban planning and urban	SEn4. Smart buildings and building	SEn5. Resources management	SEn6. Environmental protection	SEn7. Awareness rising and	SPE1. education and digital	Spe2. Research	SPE3. Creativity	SPE4. ICT - Enabled working	SPE5. Inclusive society	SLi1. Culture and leisure	SLi2. Healthcare	SLi3. Security	SLi4. Technology accessibility	SLi5. Welfare & Social inclusion	SLi6. Public spaces management	SLi7. Tourism			
1	CROWDFUNDING	1	1			1		3	1				1		1	1																		1														
2	LINK-SE-Isole Digitali			1	1	1	1	4													1						1	1										1	1			1			1			
3	link-SE-Open data	1						1		1																																						
4	LINK-SE-WI-fi area					1	1	2																																								
5	SE-bike sharing BIKEMI			1	1			2													1	1							1																			
6	MIUR-URBe-LOG	1		1	1	1		4	1												1				1			1																				
7	POR-OPTI-LOG	1		1	1	1		4	1												1			1				1																				
8	MIUR-SWaRM-Net				1	1		2																			1						1	1														
9	POR-SCUOLA -smart campus as urban open labs	1		1	1	1		4	1												1						1	1					1	1														
		1	1		1	1		4	1																		1						1	1														
10	POR-CITY-WISE-NET	1	1		1	1		4	1			1		1				1															1															
11	POR-E-WASTE				1	1		2																																								
12	MIUR-DECISION THEATRE	1				1		2		1				1																																		
13	MIUR-PSC GIUSTIZIA	1				1		2						1																																		
14	POR-SPAC3	1				1		2			1			1																																		
15	MIUR-S[m2]ART	1			1	1	1	4	1					1																																		
16	POR-ABILITY					1	1	2																																								
17	POR-GIOCO SO					1	1	2																																								
18	POR-PROACTIVE				1	1		2																			1			1																		
19	POR-SIMULATOR				1	1	1	3																																								
20	ClinSC-PE-EUGUGLE	1			1			2	1	1											1																											
21	ClinSC-PE-FR-Evue		1	1	1			3										1											1																			
22	ClinSC-City mobil 2	1	1	1		1		4				1			1							1																										
23	ClinSC-my neigbouthood my city	1				1	1	3	1																																							
24	ClinSC-smart spaces	1			1			2				1		1														1	1																			
25	area c			1				1																		1																						
26	TIDE (transprot innovation deployment for europe)	1	1	1				3											1							1																						
27	preferenza semaforica			1				1														1																										
28	guidami			1				1													1																											
29	infopaline	1		1				2														1																										
30	portali della mobilita e infoalert	1		1	1			3																			1	1																				
31	indirizzamento di parcheggi	1		1				2																			1																					
32	converse			1	1			2																	1	1	1	1																				
33	aree carico scarico			1				1																	1																							
34	merci pericolosi			1			1	2																	1		1																					
35	infomobilita per la citta di milano	1		1		1		3												1							1																					
36	ticketing payment			1				1															1			1																						
37	fare impresa	1	1					2									1																															
38	iride	1	1					2									1																															
39	E015	1	1					2																																								

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

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Milan projects analysis
(now)

Milan projects analysis (now)								DIMENSIONS																																							
								Smart Governance				Smart Economy				Smart Mobility				Smart Environment				Smart People				Smart Living																			
								PROJECT ACTIONS																																							
		gov	eco	mob	env	peo	liv	TOTAL	SGo1. Participation	SGo2. Transparency and	SGo3. Public and Social	SGo4. Multi-level governance	SGo5. Community building and	SGo6. Efficiency in municipal	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global	SEc4. Productivity	SEc5. Flexibility and conciliation	SMo1. Accessibility	SMo2. Clean, non-motorised	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and	SEn2. Energy efficiency	SEn3. Urban planning and	SEn4. Smart buildings and	SEn5. Resources management	SEn6. Environmental protection	SEn7. Awareness rising and	SPE1. education and digital	Spe2. Research	SPE3. Creativity	SPE4. ICT - Enabled working	SPE5. Inclusive society	SLI1. Culture and leisure	SLI2. Healthcare	SLI3. Security	SLI4. Technology accessibility	SLI5. Welfare & Social inclusion	SLI6. Public spaces	SLI7. Tourism		
1	sc-NETWORK DI INCUBATORI	1	1			1	1	4			1		1		1	1		1												1					1							1	1				
2	SC-INC-SMART CITY LAB		1			1	1	3							1	1		1													1				1							1	1				
3	MILANO IN	1	1			1	1	4	1						1																							1						1			
4	INNOVAZIONE SOZIALE - FABRIQ		1			1	1	3							1	1		1													1				1							1	1				
5	Milan young Citizens	1	1			1	1	4	1				1		1	1																		1	1	1		1					1				
6	BOOSTINNO	1	1			1		3	1		1		1	1	1		1																	1	1												
7	Sharing cities	1	1	1	1		1	5	1	1		1	1		1		1				1	1						1	1		1				1									1			
8	Open Care	1	1			1	1	4	1	1			1		1		1																	1	1			1		1				1			
9	CROWDFUNDING	1	1			1		3	1				1		1	1																				1											
10	SHARING ECONOMY	1	1			1		3	1		1	1	1	1	1		1		1															1	1												
11	SHARING ECONOMY-COHUB	1	1			1		3	1				1		1																				1	1		1					1				
12	NYC-milan business exchange		1					1								1	1																														
13	LINK-SE-Isole Digitali			1	1	1	1	4													1				1		1	1										1	1				1			1	
14	link-SE-Open data	1						1		1																																					
15	LINK-SE-WI-fi area					1	1	2																														1				1					
16	SE-bando makerspaces-fablabs-comune dimilano	1	1			1	1	4			1		1		1	1		1													1				1		1					1	1				
17	SE-bando coworking-camera di commercio	1	1			1	1	4							1	1		1	1												1				1		1						1				
18	SE-INC-Incubatora d'azeglio		1			1	1	3							1	1		1													1				1								1				
19	SE-bike sharing BIKEMI			1	1			2													1	1							1					1													
20	SE-INC-spazio ex Anslado		1			1	1	3							1	1		1														1				1					1			1			
21	SE-Spazi innutilizzati	1			1	1	1	4	1				1																	1								1							1		
22	SE-allogi ospidale solidale-camera di commercio	1				1	1	3					1																									1					1				
23	SE-giardini condivisi	1			1	1	1	4	1		1		1																1		1		1					1								1	
24	SE-tira su la cler	1	1		1			3			1					1														1																	
25	INC-Polihub		1			1	1	3							1	1		1														1			1	1	1						1				
26	INC-SpedMiUp		1			1	1	3							1	1		1														1				1							1				
27	INC-Parco tecnologico Padano		1			1	1	3							1	1		1														1												1			
28	INC-LEM*, Maker Space		1			1	1	3							1	1		1														1				1							1	1			
29	INC-Arte e Messaggio		1			1	1	3							1	1		1														1				1									1		

30	INC-Centro Quarenghi		1			1	1	3							1	1		1										1				1		1						1	1					
31	MIUR-URBe-LOG	1		1	1	1		4	1									1			1										1															
32	POR-OPTI-LOG	1		1	1	1		4	1									1			1											1														
33	MIUR-SWaRM-Net				1	1		2																			1					1	1													
34	POR-SCUOLA -smart campus as urban open labs	1		1	1	1		4	1									1									1	1				1	1													
35	POR-CITY-WISE-NET	1	1		1	1		4	1			1		1			1										1					1														
36	POR-E-WASTE				1	1		2																								1	1													
37	MIUR-DECISION THEATRE	1				1		2		1				1																																
38	MIUR-PSC GIUSTIZIA	1				1		2						1																																
39	POR-SPAC3	1				1		2			1			1																																
40	MIUR-S[m2]ART	1			1	1	1	4	1					1																																
41	POR-ABILITY					1	1	2																																						
42	POR-GIOCOSO					1	1	2																																						
43	POR-PROACTIVE				1	1		2																			1		1				1	1												
44	POR-SIMULATOR				1	1	1	3																																						
TOTAL		24	24	6	15	39	26	3,0455	15	4	7	3	12	7	21	17	5	14	1	0	6	2	0	2	1	0	6	6	5	14	5	4	4	20	21	15	0	11	2	2	1	11	17	3	1	
Milan projects analysis (now)		gov	eco	mob	env	peo	liv	AVERAGE NUMBER OF DIMENSIONS PER PROJECT	SGo1. Participation	SGo2. Transparency and	SGo3. Public and Social	SGo4. Multi-level governance	SGo5. Community building	SGo6. Efficiency in municipal	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global	SEc4. Productivity	SEc5. Flexibility and	SMo1. Accessibility	SMo2. Clean, non-motorised	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and	SEn2. Energy efficiency	SEn3. Urban planning and	SEn4. Smart buildings and	SEn5. Resources management	SEn6. Environmental	SEn7. Awareness rising and	SPE1. education and digital	Spe2. Research	SPE3. Creativity	SPE4. ICT - Enabled working	SPE5. Inclusive society	SLi1. Culture and leisure	SLi2. Healthcare	SLi3. Security	SLi4. Technology accessibility	SLi5. Welfare & Social inclusion	SLi6. Public spaces	SLi7. Tourism	
		PROJECT ACTIONS																																												
		Smart Governance								Smart Economy								Smart Mobility								Smart Environment								Smart People				Smart Living								
		DIMENSIONS																																												

Milan Challenges analysis (before)		1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS							4.GLOBAL URBANIZATION							5. ECONOMIC INSTABILITY							6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES								
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.		
1	CROWDFUNDING															1	1	1						1		1					1	1							1	1				1	
2	LINK-SE-Isole Digitali	1		1			1																	1		1			1										1				1		
3	link-SE-Open data							1	1							1	1							1		1												1				1			
4	LINK-SE-WI-fi area							1	1					1										1		1												1	1						
5	SE-bike sharing BIKEMI	1		1			1		1	1														1		1			1																
6	MIUR-URBe-LOG	1		1			1																	1	1				1		1							1	1						
7	POR-OPTI-LOG	1		1			1									1		1						1	1				1		1						1	1				1			
8	MIUR-SWaRM-Net	1		1		1										1		1						1		1																			
9	POR-SCUOLA -smart campus as urban open labs	1		1			1																	1				1										1		1			1		
10	POR-CITY-WISE-NET	1		1		1																																1		1					
11	POR-E-WASTE	1		1			1																	1	1					1	1		1												1
12	MIUR-DECISION THEATRE	1						1						1				1			1			1		1				1	1														
13	MIUR-PSC GIUSTIZIA															1				1	1			1		1												1	1						
14	POR-SPAC3															1				1				1		1												1	1						
15	MIUR-S[m2]ART	1				1																		1	1														1						
16	POR-ABILITY							1				1												1		1			1									1	1						
17	POR-GIOCOSO							1				1												1		1				1								1	1						
18	POR-PROACTIVE																							1		1			1									1	1						
19	POR-SIMULATOR	1				1																		1	1	1																			
20	ClinSC-PE-EUGUGLE	1		1			1	1								1		1						1				1	1									1		1			1		
21	ClinSC-PE-FR-Evue	1		1			1									1		1						1	1				1		1							1			1				
22	ClinSC-City mobil 2	1		1			1																	1	1				1									1			1				
23	ClinSC-my neigbouthood my city							1	1	1				1		1		1	1					1		1		1										1							
24	ClinSC-smart spaces	1		1			1	1								1	1				1																	1	1			1			
25	area c	1		1			1																	1				1																	
26	TIDE (transprot innovation deployment for europe)	1		1			1																	1				1											1		1		1		
27	preferenza semaforica	1		1			1																	1						1									1		1				
28	guidami	1		1			1		1	1														1		1				1								1		1		1			
29	infopaline	1		1			1																	1					1									1		1					
30	portali della mobilita e infoalert																							1		1												1							
31	indirizzamento di parcheggi																							1		1												1							
32	converse	1		1			1																															1				1			
33	aree carico scarico	1		1			1																	1	1				1		1						1			1					
34	merci pericolosi																																												
35	infomobilita per la citta di milano							1	1					1										1		1												1			1				
36	ticketing payment	1		1			1																	1					1								1		1		1				
37	fare impresa																							1		1				1	1						1	1							
38	iride															1				1				1		1						1	1				1	1							

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

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Milan Challenges analysis (now)		1. CLIMATE CHANGE						2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS						4.GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES											
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.	
1	sc-NETWORK DI INCUBATORI																						1					1	1				1			1	1				1			
2	SC-INC-SMART CITY LAB							1						1									1					1			1	1				1	1				1			
3	MILANO IN							1	1							1	1												1	1				1	1					1	1			
4	INNOVAZIONE SOZIALE - FABRIQ							1						1									1					1		1			1	1			1	1			1			
5	Milan young Citizens							1				1																1					1			1	1					1		
6	BOOSTINNO							1								1				1								1					1	1			1	1				1		
7	Sharing cities	1		1			1	1	1	1				1		1	1	1					1				1	1		1	1	1		1	1			1	1			1		
8	Open Care							1	1			1											1		1				1			1			1	1				1				
9	CROWDFUNDING															1	1	1					1		1				1	1			1			1	1				1			
10	SHARING ECONOMY	1		1												1		1					1					1					1	1			1	1				1		
11	SHARING ECONOMY-COHUB																						1		1				1	1			1	1			1	1				1		
12	NYC-milan business exchange																											1	1					1										
13	LINK-SE-Isole Digitali	1		1			1																1		1				1							1				1			1	
14	link-SE-Open data							1	1							1	1						1		1										1				1			1		
15	LINK-SE-WI-fi area							1	1					1									1		1									1			1	1				1		
16	SE-bando makerspaces-fablabs- comune dimilano							1				1											1		1				1	1			1	1			1	1			1			
17	SE-bando coworking-camera di comercio							1				1											1		1				1	1			1	1			1	1			1			
18	SE-INC-Incubatora d'azeglio							1	1					1									1					1	1			1	1			1	1				1			
19	SE-bike sharing BIKEMI	1		1			1		1														1		1				1					1										
20	SE-INC-spazio ex Anslado							1						1									1					1	1			1	1			1	1				1			
21	SE-Spazi inutilizzati	1	1					1	1	1	1	1		1	1	1	1	1			1		1		1																			
22	SE-allogi ospidale solidale- camera di commercio							1	1	1													1		1																			
23	SE-giardini condivisi	1	1	1	1	1	1		1	1				1		1	1	1			1		1				1		1															
24	SE-tira su la cler							1						1									1				1		1						1									
25	INC-Polihub							1				1																	1	1				1			1	1				1		
26	INC-SpedMiUp							1				1																	1	1				1			1	1				1		
27	INC-Parco tecnologico Padano																												1	1					1			1	1				1	
28	INC-LEM*, Maker Space							1				1																	1	1				1			1	1				1		
29	INC-Arte e Messaggio							1				1																	1	1		1	1		1			1	1				1	
30	INC-Centro Quarenghi							1				1											1						1	1				1	1			1	1				1	
31	MIUR-URBe-LOG	1		1			1																1	1					1						1	1								
32	POR-OPTI-LOG	1		1			1									1		1					1	1					1						1	1				1				
33	MIUR-SWaRM-Net	1		1		1										1		1					1		1																			
34	POR-SCUOLA -smart campus as urban open labs	1		1			1																1					1						1	1				1			1		
35	POR-CITY-WISE-NET	1		1		1																															1			1				
36	POR-E-WASTE	1		1			1																1	1												1							1	
37	MIUR-DECISION THEATRE	1						1						1		1			1		1		1		1				1	1														
38	MIUR-PSC GIUSTIZIA															1				1	1		1		1											1	1							

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

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Annex 4: Analysis of initiatives: Barcelona

A4. 1. Barcelona stakeholders' opinions

A4. 1.2. Barcelona stakeholders' opinions: other stakeholders

A4. 1.3. Barcelona stakeholders' opinions: challenges

A4. 2. Barcelona implementation analysis

A4. 2.1. Barcelona implementation analysis: stakeholders (Smart and Digital city)

A4. 2.2. Barcelona implementation analysis: projects (Smart and Digital city)

A4. 2.3. Barcelona implementation analysis: challenges (Smart and Digital city)

A4.1. Barcelona Stakeholders' opinions

A4.1.2. Barcelona stakeholders' opinions: stakeholders

	political	knowledge	economic	social
Josep Roca y Blanca Arellano, directores postgrado Smart Cities UPC	francesca bria	Vicente guallart	Josep Ramon ferré	usuarios
	fernando pindado		lluis sans	
	policy makers	ESADE		neighborhood associations
	Francesca Bria	UAB		civic organizations
Esteve Almirall-ESADE		UAB Mayo		
		Ateneu		
Jordi Roig de Zárata, del Departamento de Microelectrónica y Sistemas Electrónicos. UAB/mass factory app&town	Francesca Bria	UPC	Mobile Capital	World XOBB (Xarxa oberta de bicos de Barcelona)
	IMI			
	Lluis Torrent (innovación ayuntamiento)		Grandes jefes de mobile World	Mesa del tercer sector de Cataluña (área de innovación y tecnología)
	Julio Calvo(innovación ayuntamiento)		Telefónica	
Jordi Picas-SUARA	Gobierno de la Generalitat			
			Josep Ramon Ferre	ciudadanos,
			María Galindo	
			startups	
Juan Campos-Sensefields			Cisco	
			Abertis-Cellnex	
Tomas Díez director of Fab Lab Barcelona				
Salvador Clarós - Asociación de vecinos Poblenou	Salvador rueda.	Universidadmovilidad: PTP: promoción del transporte público.		Proyecto coopolis: Can Batlló
				Taula, Eix Peraca
	Ayuntamiento: coordinación		operadoras	
			empresas tecnológicas	
Carles Batalla-CISCO	Ayuntamiento: IT			
	Alcalde trias			
Fernando Pindado - Area de Participación-Ayuntamiento Barcelona	Ayuntamiento	UIC		Organizaciones sociales estructuradas
	localret	UAB		
		Pompeu Fabra		
Jorgina Martinez - Ateneus de Fabricacio	red publica fablabs		pequenos grupos de emprendedores que trabajan con contraprestación	
	bcn activa		red fablabs	asoc bicivleta

Pilar Conesa - Anteverti					pier01
					consultoras en
					estrategia esmart
					city ej. DOXA,
					Gabriel teoo, comunidades de
		ateneus de fabricac	la salle		barquena startups: tech city
					universidades: másteres y
		barcelona activa			cusros profesionales: UPC fab labs
					colegios: scola nova XXI
Rosa Paradell - Fundacio i2cat					scola del clot
Janet Sanz - Dirección del Área de Ecología, Urbanismo y Movilidad - Ayuntamiento de Barcelona					Francesca Bria
					barcelona activa
					(new sector digital
					economy)
					industry social
					barcelona activa
					(digital education
					City hall deparmente
					from urbanism
Francesca Bria- Comisionada de Tecnología - Ayuntamiento de Barcelona					IMI
					department of social
					rights
					agencies: mobility
					agency
TOTAL		26		14	18 12

A4.1.3. Barcelona stakeholders' opinions: challenges

	Josep Roca y Blanca Arellano	Esteve Almirall	Jordi Roig de Zàrate	Jordi Picas	Juan Campos	Tomas Diez	Salvador Clarós	Carles Batalla	Fernando Pindado	Jorgina Martínez	Pilar Conesa	Rosa Paradell	Janet Sanz	Francesca Bria	
global trends	Climate Change	5	2	4	5	4	5	4	4	3	3	2	3		3,7
	Social Polarization	5	4	4	4	3	3	4	5	5	4	5	5		4,3
	Need for new governance models	5	4	2	4	4	4	3	4	4	4	4	4		3,8
	Global urbanization	4	3	2	4	4	4	3	3	4	3	2	3		3,2
	Economic instability	4	4	3	4	3	4	3	4	4	3	4	3		3,5
	Technology driven approaches to urban issues	3	5	3	4	5	4	3	3	5	3	3	3		3,6
challenges	Reducing ecological footprint and pressure over ecosystems, fostering ecological functions of land	3	3	4	3	4	5	4	4	4	4	2	3		3,6
	Implementing and coordinating new technologies for energy saving and emission reductions through planning and governance tools	4	5	4	5	4	5	4	4	3	3	2	4		3,9
	Managing adaptation to innovation and knowledge based economies while providing solutions to a broad skill base	2	5	4	4	3	4	2	3	4	4	3	4		3,5
	Improving effectiveness of institutions, coordination among public bodies and multilevel governance (leading to more integrated sectoral policies)	5	2	5	3	4	3	3	4	5	1	4	3	4	3,5
	Promoting equity in access to labour market and conciliation of work and family life	5	3	4	4	5	5	4	5	4	3	4	4	4	4,2
	Implementing a holistic approach to environmental issues	4	4	4	4	4	5	3	5	4	3	4	2	3	3,8
	Fostering social inclusion and cohesion	5	4	5	4	3	5	3	4	5	4	4	5	5	4,3
	Increasing efficiency in resources management (energy, water, etc) and circular economy	5	5	4	5	4	5	3	4	5	4	3	3	4	4,2
	Articulating mobility planning tools and policies with innovations in the sector	5	5	5	4	5	4	3	3	4	3	3	2	5	3,9
	Fostering human and social capital as source of innovation	4	5	4	4	4	5	4	4	4	3	4	5	3	4,1
	Fostering sustainable accessibility in cities and promoting sustainable, inclusive and healthy mobility when needed	5	4	5	3	4	5	3	4	4	4	4	3	4	4,0
	Eradicating spatial exclusion and promoting equity in access to housing and quality urban environments	5	4	5	4	4	5	3	3	5	4	5	4	3	4,2
	Enhancing social diversity as a dynamic asset	4	3	5	3	3	5	2	3	3	3	3	3	4	3,4
	Shifting to more participative and inclusive democracy	5	5	3	5	4	5	3	4	5	4	4	5	4	4,3
	Enhancing equity within society	5	4	5	4	3	5	5	4	4	3	4	4	3	4,1

Developing a coordinated Climate Change mitigation strategy	5	2	4	4	4	5	4	4	3	2	3	2	3		3,5
Fostering resilience of cities regarding climate change and disasters risks	5	2	4	4	3	5	3	3	3	2	3	2	3		3,2
Reducing externalities of new technologies implementation (i.e. cybersecurity)	4	3	2	4	3	5	2	4	4	2	3	3	4		3,3
Enhancing territorial cohesion	5	2	4	4	5	5	3	4	3	3	4	4	3		3,8
Managing urban population growth while reducing negative externalities	1	4	4	4	4	5	4	3	3	2	3	3	2		3,2
Fostering citizenship urban cocreation and comanagement combining top-down and bottom-up models	3	3	4	4	3	5	3	3	4	3	4	5	4		3,7
Strengthening inclusion of migrants and refugees	4	2	5	4	4	5	3	3	4	1	4	4	4		3,6
Adapting the city economic and social life to ageing population while attracting young and children	5	2	5	4	4	4	3	4	4	2	4	4	3		3,7
Developing eco-friendly urban environments and answering to growing environmental concerns	4	3	5	4	5	4	4	4	4	2	3	2	4		3,7
Balancing urban growth and territorial development (urban-rural balance management)	1	1	4	4	4	3	3	5	3	2	2	3	2		2,8
Improving resiliency of economic systems and adaptation to changes in global and local economies	3	2	4	4	4	5	3	5	3	1	3	2	3		3,2
Maintaining quality of life in cities assuring access to services according to changes in demand (education, health, culture, safety, etc)	5	2	4	4	5	5	2	4	5	2	4	3	4		3,8
Increasing flexibility and resiliency of governance models	3	3	5	4	4	4	3	3	3	2	3	3	3		3,3
Fostering technological innovation driven by social and human capital	4	3	5	5	5	5	4	4	4	4	4	4	4		4,2
Enhancing integration in global economies promoting cooperation among cities and territories	4	2	5	3	4	5	4	3	3	4	4	3	3		3,6
Fostering employment creation with high quality standards	3	4	3	4	5	5	5	5	4	2	4	3	3		3,8
Achieving balance between competitiveness and quality of life	5	3	3	4	4	5	3	4	3	2	4	3	3		3,5
Enhancing adaptation of society, governance and economy to transformations through ICT	3	4	5	4	3	5	3	4	4	4	4	3	4		3,8
Improving sustainability and diversity of local economies in balance with cities specialization	5	3	5	4	4	5	3	3	4	2	3	3	4		3,7
Fostering interurban variety and cities willingness and protecting cultural heritage	5	3	5	3	3	5	4	4	3	2	3	2	3		3,5
Developing new planning tools for sustainable development (less urban sprawl, policentric plans, increased density and diversity, mixed land use, urban refurbishment...)	1	3	5	4	3	3	3	4	4	3	3	3	2		3,2
Incorporating and regulating innovative management systems at local level while improving capacity building (ie. PPP or PPPP, e-governance, etc)	4	4	4	4	4	4	2	5	3	3	4	2	3		3,5

A4.2. Barcelona Implementation analysis

A4.2.1. Stakeholders analysis (Smart and Digital City)

Barcelona Smart N. City projects	Entities involved	Type of stakeholders
> Agenda 21 and		
1 Citizen Commitment	Ajuntament de barcelona	local government
2 > Antenna Plan	Ajuntament de Barcelona	local government
	Fundación once	civil society
	sant pere claver findacio de serveis socials	civil society
	ampans	company
	Mass Factory Urban Accessible Mobility, S.L. (Mass Factory	company
	Smart columbus	company
	STL	company
3 > App&Town	Universitat Autònoma de Barcelona (UAB-spinoff	knowledge
4 > ApparkB	B:SM, Barcelona de Serveis Municipals (, mediante la Unidad Operativa de ÀREA	local government
5 > Apps4BCN	Ajuntament de Barcelona	local government
	Camara de comercio de Barcelona	civil society
	Barcelona Globnal association	civil society
	Fira de Barcelona	company
	Ajuntament de Barcelona / Business Assistance Office	local government
6 > Barcelona Growth	Turismo de Barcelona	local government
7 > Barcelona WIFI	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)/ Dirección de Telecomunicación e Infraestructuras	local government
	Bloomberg foundation	civil society
	Ajuntament de Barcelona / Derechos sociales	local government
8 > BCN links	Imagine Creativity Center	local government
> BCN Open Government (App and Website)	Ajuntament de Barcelona / Gerència de Drets de Ciutadania, Participació i Transparència	local government
	COBRA Instalaciones y Servicios S.A. (COBRA)	company
	Enercast GmbH (ENER)	company
	ETRA Research and Development, S.A. (ETRA)	company
	FICO Cables Lda (FICO)	company
	Hypertech AE (Hypertech)	company
	Portugal Telecom Inovação, SA (PTIN)	company
	Sodexo Facility Management (SDXFM)	company
	Universität Duisburg-Essen (UDE)	knowledge
	Lisboa E-Nova Agencia Municipal De Energia E Ambiente De Lisboa (LBN)	local governemnt
10 > BESOS	Ajuntament de Barcelona (BCN)	local government
	Clear channel	company
	vodafone	company
11 > Bicing	B:SM Barcelona de serveis municipals	local government
	antennas	company
	Cisco	company
	Schneider Electric	company
	centros de investigaci3n (ver)	knowledge
12 > Bit Habitat	Ajuntament de Barcelona	local government
> Board of Public Services and		
13 Infrastructures	Ajuntament de Barcelona	local government
	Ajuntament de Barcelona	local government
14 > Bus Area	B:SM, Barcelona de Serveis Municipals	local government
	hangar	company
	Institute for Advanced Architecture of Catalonia (IAAC), Fab lab barcelona (IaAC)	knowledge
15 > Citizen Sensors		

		ajuntament de Barcelona / Gerència de Drets de Ciutadania, Participació i Transparència/ Direcció de Serveis d'Informació i Atenció Ciutadana. Departament d'Avaluació d'Incidències i Qualitat	
16	> Citizens' Letter Box		local government
		AvePoint,	company
		Bism@rt,	company
		Cast-info,	company
		Cellnex Telecom,	company
		CityAbility,	company
		CityZenith,	company
		Ecocity Builders,	company
		Ecube Labs Co., Ltd.,	company
		ESSI Projects,	company
		ImexSystems Inc.,	company
		Mercato Solutions,	company
		Microsoft,	company
		Nerei Emotional Intelligent,	company
		OptiCitis Ingeniería Urbana,	company
		SmartGAFSA,	company
		Sociálitás,	company
		Surface Mobility Consultants	company
		TICE.PT,	company
		Consensus Institute Inc.,	company
		Diputació de Barcelona,	government
		Government of Catalonia,	government
		Bandung Institute of Technology,	knowledge
		Computation Institute – The University of Chicago,	knowledge
		FUNITEC La Salle,	knowledge
		Global Cities Institute – University of Toronto,	knowledge
		IESE Business School,	knowledge
		Institute for Advanced Architecture of Catalonia (IAAC),	knowledge
		Universitat Autònoma de Barcelona,	knowledge
		Universitat Rovira i Virgili	knowledge
17	> City Protocol	Ajuntament de Barcelona	local government
18	> CityOS	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)/ Oficina de Sociedad del Conocimiento del IMI	local government
		European Network of Living Labs	civil society
		Forum Virium Helsinki, Finland	civil society
		Alfamicro, Portugal	company
		CASPUR, Italy	company
		FutureEverything, UK	company
		Gnosis Computers, Greece	company
		ISA Intelligent Sensing Anywhere, Portugal	company
		Lynx, Italy	company
		TAGES, Turkey	company
		Waag Society, Netherlands	company
		Amsterdam University of Applied Sciences, Netherlands	knowledge
		ESADE, Spain	knowledge
		Instituto Superior Técnico, Portugal	knowledge
		University of Tilburg, Netherlands	knowledge
		Sanoma, Finland	local government
19	> CitySDK	cities and city regions: Amsterdam, Netherlands, Barcelona, Spain, Helsinki, Finland, Istanbul, Turkey, Lamia, Greece, Lisbon, Portugal, Manchester, UK, Rome, Italy	local government
20	> Cloud BCN – Multi-council Open Data	Ayuntamiento de Badalona, Ayuntamiento de Barcelona, Ayuntamiento de Cornellà, Ayuntamiento del Prat de Llobregat, Ayuntamiento de Sant Feliu de Llobregat, Ayuntamiento de Tarragona, Ayuntamiento de Viladecans, Ayuntamiento de Sant Cugat, Ayuntamiento de Manresa	local government
21	> CloudOpting	CSI piemonte	company

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		Electric corby	company
		NetPort Science Park	company
		Profesia	company
		SDG	company
		Smart Partners	company
		Teamnet	company
		Wellness telecom	company
		Worldline	company
		Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
		Guifi Net	civil society
		Forum Virium Helsinki	civils society
		CASPUR	company
		Lynx	company
		NESTA	company
		Waag society	compna
		Provincia di Roma	government
		Esade	knowledge
		Fraunhofer Fokus	knowledge
		Universitat Pompeu Fabra Barcelona	knowlefge
		Ajuntament de Barcelona	local government
		Manchester Digital development Agency	local government
		City of Amsterdam/ Economic development department	local government
22	> Commons4EU	Sotopen	x
		Ajuntament de Barcelona / Dirección de Comunicación y Atención Ciudadana	local government
23	> Contactless Barcelona	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
24	> Culture notebook	Ajuntament de Barcelona / Instituto de Cultura	local government
		Enea	company
		Freemind Consulting	company
		Gas Natural Fenosa	company
		Hewlett Packard Enterprise	company
		Seventh Framework Programme	governement
		European Commission	governemnt
		CSUC	knowledge
		Inria	knowledge
		Universität Mannheim	knowledge
		University of Passau	knowledge
		Create-Net	knowledge
25	> DC4Cities	Ajuntament de Barcelona	local government
	> Deployment of Smart Infrastructures in Public Areas	Ajuntament de Barcelona	local government
26		Ajuntament de Barcelona	local government
27	> eAdministration	APSOCECAT	civil society
		Assemblea Aturats i Aturades Nou Barris	civil society
		Associació Aprenem Barcelona	civil society
		AVV de Prosperitat	civil society
		Hortciutat	civil society
	> Empty spaces (Pla buits)	ATRA-ATART UTE	civil society
28		Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		Antonio Lucio Gil	company
		Nommon Solutions and Technologies, S.L	company
		Center for Advanced Spatial Analysis CASA, UCL	knowledge
		Institut für Verkehrspranung und Transportsysteme, ETH Zurich	knowledge
		Institute de Physique Théorique IPhT, CEA	knowledge
		Institute for Cross-Disciplinary Physics and Complex Systems IFISC, CSIC-UIB	knowledge
29	> EUNOIA	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica	local government

		Conseil général des chambres de commerce de Catalogne	civil society
		Ara Lleida	government
		Catalan Turist Board	government
		Députation provinciale de Gérone	government
		Députation provinciale de Tarragone	government
		Diputació de Barcelona,	government
		Office de tourisme de Barcelone	local government
	> Geographic Integration System	Office de tourisme de la Costa Brava - Gérone	local government
		Office de tourisme de Lérida	local government
30	(GIS)	Office de tourisme de Tarragone	local government
		SIRESA (TERSA)	company
31	> Green points	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat-departament de Gestió de Residus	local government
		DISTRICLIMA (COFELY+TERSA+AGBAR+IDEA+EFIENSA)	company
	> Hot and Cold	ENGIE (GDF SUEZ Energy Services)	company
32	Network	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		Citilab	civil society
		Abertis Telecom	company
		Cisco systems	company
		Fraunhofer Institute FOKUS	knowledge
		Fundació per la Universitat Oberta de Catalunya (UOC)	knowledge
		Ajuntament de Barcelona	local government
		Bologna Municipality	local government
33	> iCity	City of Genova	local government
		ABERTIS TELECOM	company
		ADTEL	company
		ALTRAN	company
		ANALISIS Y SIMULACION	company
		ANCONNECT	company
		BTECH	company
		CAST INFO	company
		CESCA – CSUC	company
		CIDAUT	company
		CIMALSA	company
		CIRCUIT CATALUNYA	company
		CITILAB	company
		CLUSTERMOTO	company
		COPERDATA	company
		DISMODEL	company
		EFFITRONIX	company
		ENGI-COM	company
		ERNI	company
		ESI	company
		FICOSA	company
		FUNDACIO CIM	company
		GENTIC	company
		GESTAMP	company
		GRANOLLERS MERCAT	company
		GRANTA	company
		HPCNOW!	company
		I4KLORTEK	company
		IBM	company
		IDIADA	company
		INGEDETEC	company
		LEITAT	company
		MEGATECH	company
		MELEGHY	company
		MICROSOFT	company
34	> Industrial Ring	NAE	company

	NISSAN	company
	OPENTEL	company
	PARC AUDIOVISUAL DE CATALUNYA	company
	PARC UPC	company
	POLIGON BUFALVENT	company
	PROSEGUR	company
	RDT INGENIEROS	company
	RUECKER-LYPSA	company
	SEAT	company
	SIDER	company
	SMP	company
	SOLUTE	company
	TECNOCAMPUS	company
	T-SYSTEMS	company
	XARXA OBERTA	company
	Ajuntament de Barcelona / Barcelona activa	local government
	Fundación Antoni Cambrodí	civil society
	infantium	company
	I Instituto de Psicología Evolutiva	knowledge
	UAB-departament de Psicologia Evolutiva y Educación de la UAB	knowledge
35 > Infantium	Ayuntamiento de Lleida a través del Instituto Municipal de Educación,	local government
	Nommon Solutions and Technologies	company
	Centre for Advanced Spatial Analysis, CASA, University College London	knowledge
	Instituto de Física Interdisciplinar y Sistemas Complejos	knowledge
	Universidad Politécnica de Madrid (Project Coordinator)	knowledge
	Urban Planning Group, Eindhoven University of Technology	knowledge
36 > INSIGHT	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica	local government
	Digital Tangible,	company
	Diputació de Barcelona,	government
	Generalitat de Catalunya /departament de cultura	government
	Ministerio de educación, cultura y deporte	government
37 > Libraries	Ajuntament de Barcelona	local government
> Lighting master plan	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
38	ETRA	company
	Gas natural.FENOSA	company
	Generalitat de Catalunya	company
	Nissan	company
	Renault	company
	Seat	company
	volkswagen	company
	Ajuntament de Barcelona	local government
	Ajuntament de Barcelona / Barcelona activa	local government
	AMB Area Metropolitana de barcelona	local government
> LIVE Electric	B:SM Barcelona de serveis municipals	local government
39 Vehicle	TMB transports metropolitans de barcelona	local government
	Ajuntament de Barcelona / Regidor de Empresa i Turisme de l'Ajuntament de Barcelona	local government
> Manufacturing centres	Ajuntament de Barcelona	local government
40	Vanapedal	civil society
	Ajuntament de Barcelona / Dirección de Movilidad	local government
	Dirección de Comercio	local government
	Distrito de Ciutat Vella,	local government
> Micro-platforms	Instituto de Paisaje Urbano	local government
41 for goods deliveries	Instituto de Paisaje Urbano	local government
42 > Mobile Services	Ajuntament de Barcelona / Gerència de Drets de Ciutadania, Participació i Transparència	local government

	Firmaprofesional	company
	Ajuntament de Barcelona / Gerència de Drets de Ciutadania, Participació i Transparència	local government
43 > mobileID	Localret	local government
	Casc antic sense barriers	civil society
	Espai AmbientalAssociació	civil society
	Ethnic-Associacio de turismo sostenible	civil society
	Rezero (fundacio prevenció residus i consum)	civil society
	Societat Catalana d'Educació Ambiental	civil society
	Spai tres	civil society
	Ciència en Societat	civil society
	Green Map	company
	ICO	company
	Naturalwalks	company
	Opcions	company
> More Sustainable	Raonspublicques coopertica d urbanisme', arquitectura I participacio	company
44 Barcelona Map	Ajuntament de Barcelona	local government
	GSMA (Groupe Speciale Mobile Association)	company
	Mobile World Capital Barcelona	company
	Generalitat de Catalunya	government
45 > mSchools	Ajuntament de Barcelona	local government
	Mobility Pact Public Transport Working Group.	civil society
	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
46 > New Bus Network	TMB transports metropolitans de barcelona	local government
> New Telecommunications		
47 Network	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
> New Tourist		
48 Products	Ajuntament de barcelona / Area de empresa cultura e inovacion/ concejalia de empresa y turismo	local government
	Ajuntament de Barcelona / Commissioner of Digital Technology and Innovation	local government
49 > Open Data BCN		local government
50	Ajuntament de Barcelona	local government
	Ajuntament de Barcelona / Gerència de Drets de Ciutadania, Participació i Transparència/ Oficina para la Transparencia y las Buenas Prácticas	local government
51 > Open Government		
	CSI-Piemonte	company
	NetPort Science Park	company
	SAMPAS IT and communication systems	company
	Piedmont region	government
	Politecnico di Torino	knowledge
	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
	Ajuntament de Lleida	local government
	BDigital	local government
	Municipality of Karlshamn	local government
52 > Open-DAI	Ordu Municipality	local government
> Organic Waste		
53 Recycling	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
> Portal for		
54 Procedures	Ajuntament de Barcelona / Instituto Municipal de Hacienda	local government
	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
> Public Works		
55 Information Service	Ajuntament de Barcelona Hàbitat Urbà	local government
	Ajuntament de Barcelona / Instituto Municipal de Servicios Sociales (IMSS)	local government
56 > Radar		
	AMPAS	civil society
	asocaciones de barrio	civil society
	Duna	company
	Ajuntament de Barcelona / área de Prevención, Seguridad y Movilidad	local government
	Ajuntament de Barcelona / IMEB (Instituto Municipal de Educación de Barcelona)	local government
57 > School pathways		

	escuelas	(s	escoles
	Antoni Brusi, Bogatell i Vila Olímpica,		l'institut
	Icària i l'escola bressol La Mar Xica. En el projecte,		també hi participen les escoles Arenal de Llevant, La
	Llacuna, La Mar Bella, Pere IV, Acàcies, Fluvià, Voramar		i Grèvol, l'escola bressol El Xalet de la Paperera i l'escola
	especialitzada La Sagrera. A) 2009. Actrualemnte 37+20		local government
	moville		local government
	Servei d'Educació Viària de la Guàrdia Urbana.		local government
58	> Sentilo	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
	> Shared innovation		
59	centres	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		Ajuntament de barcelona / Area de empresa cultura e inovacion/	
60	> Signposting	concejalía de empresa y turismo	local government
	> Smart City	Cisco	company
61	Campus	Schneider Electric	company
62	> Smart Grid	endesa	company
		Abertis telecom	company
		Worldsensing	company
		Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
63	> Smart Parking	B:SM Barcelona de serveis municipals	local government
		ETRA	company
		Sensefields	company
64	> Smart traffic lights	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
	> Smart Vegetable		
65	Garden	Escola Rel	company
	> Smart Vegetable		
66	Garden	Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		Admira	company
		CISCO	company
		Ficosa	company
		Intel	company
		JCDcaux	company
		Telefónica	company
		Ajuntament de Barcelona	local government
67	> Smartquesina	TMB transports metropolitans de barcelona	local government
	> Social-inclusion	Ajuntament de Barcelona	local government
68	Apps	Apps4bcn	local government
		Telecentre.org Foundation	civil society
		Direcció General de Telecomunicacions i Societat de la Informació	
		de la Generalitat de Catalunya	government
69	> Spark Lab	Ajuntament de Barcelona	local government
		Ajuntament de Barcelona / Àrea d'Ecologia, Urbanisme i Mobilitat	local government
		BCN ecologia	local government
70	> Superblocks	decidim barcelona	local government
71	> Telecare	Ajuntament de Barcelona / Derechos Sociales	local government
	> Telecontrolled		
	ornamental		
72	fountains	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
	> Telecontrolled		
73	watering	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
		Col·legi d'Advocats de Barcelona	civil society
		Escola Vilorai	civil society
	> The city I want to	Hospital Sant Joan de Déu.	government
74	live in	Ajuntament de Barcelona / l'Institut Municipal d'Informàtica (IMI)	local government
75	> Touch Screens	Ajuntament de Barcelona	local government
	> Virtual Citizen's	Ajuntament de Barcelona / Gerència de Drets de Ciutadania,	
76	Advice Office	Participació i Transparència	local government
	barcelona startups		
77	map	Ajuntament de Barcelona / barcelona activa	local government

Barcelona Digital City		Type of
N.	Projects	Entities involved stakeholders
		asociaciones
		civil society
		empresas fabricantes
		company
		ingenierías
		company
		proveedores tecnológicos
		company
		centros de investigación
		knowledge
		universidades
		knowledge
		ayuntamiento de Barcelona
		local government
1	BCN Industry 4.0 Hub	Gobierno municipal
		local government
2		ayuntamiento de Barcelona
		local government
3	Bicing	Barcelona de Serveis Municipals, S.A.
		public company
4	Big Data for Public Policies	ayuntamiento de Barcelona
		local government
		citymart
		company
		ayuntamiento de Barcelona
		local government
5	Challenges and rewards	new york city
		local government
		Barcelona activa
		local government
6	Cibernàrium	Biblioteques municipales
		local government
7	City Data analytics office	ayuntamiento de Barcelona
		local government
		TRADIA TELECOM, S.A.
		company
		ACCENTURE S.L
		company
		COFELY ESPAÑA S.L
		company
		SINOVIA SNC
		company
		ayuntamiento de Barcelona
		local government
8	CityOS	IMI
		local government
9	Decidim barcelona	ayuntamiento de Barcelona
		local government
		Fundación Telefónica, la Fundación Vodafone, la Fundación Orange, la empresa Cisco y la empresa Lenovo
		civil society
		Fundación Vodafone
		civil society
		Fundación Orange
		civil society
		CISCO
		company
		Lenovo
		company
10	Declaration of Barcelona for digital social inclusion	ayuntamiento de Barcelona
		local government
		Dyne.org
		civil society
		Nesta
		civil society
		Thingful
		company
		ThoughtWorks Ltd
		company
		Waag
		company
		CNRS
		knowledge
		Eurecat
		knowledge
		Open University of Catalonia
		knowledge
		Politecnico di Torino/Nexa
		knowledge
		Stichting Katholieke Universiteit Nijmegen Privacy & Identity Lab
		knowledge
		UCL
		knowledge
		Ayuntamiento de Amsterdam
		local government
		ayuntamiento de Barcelona
		local government
11	DECODE	Institut Municipal d'Informatica de Barcelona (IMI)
		local government
		ayuntamiento de Barcelona
		local government
12	Digital commons for social inclusion	Fundación guifi.net
		civil society
		ayuntamiento de Barcelona
		local government
		Consorcio de Bibliotecas de Barcelona
		local government
		Barcelona activa
		local government
13	Digital education and digital social inclusion	Ateneus de fabricacion
		local government
14	Digital identity	ayuntamiento de Barcelona
		local government
15	Digital Market	ayuntamiento de Barcelona
		local government
		Fundacja ePanstwo
		civil society
16	Digital Social Innovation Programme (DSI4BCN)	nesta
		civil society

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

		betterplace lab	company
		waag	company
		wemake	company
		Fab lab barcelona	knowledge
		Barcelona activa	local government
		4YFN	civil society
		mobile world capital barcelona	civil society
		Damm	company
		Fira Barcelona	company
		GSMA	company
		Orange	company
		techstars	company
		Telefónica	company
		Vodafone	company
		generalitat de catalunya	government
	Digital Technology	Ministerio de economía industria y turismo	government
17	entrepreneurship	ayuntamiento de Barcelona	local government
		asociaciones empresariales	civil society
		patronales	civil society
		ciudadanos	civil society
		pymes	company
		grandes empresas	company
		clusteres	company
		administración publica catalana	government
		administración publica estatal	government
		administración publica internacional	government
		mundo academico	Knowledge
		investigación	Knowledge
18	Ecosystem of innovation	ayuntamiento de Barcelona	local government
		Mobile World capital barcelona	civil society
		Mobile World Congress	company
		Soko Tech	company
		eduCaixa	financial institution
		Generalita de Catalunya	government
		Ateneus de Fabricacion	local government
		ayuntamiento de Barcelona	local government
		bibliotecas	local government
		Centros civicos	local government
19	Educational events	Cibernàrium	local government
		ayuntamiento de Barcelona	local government
20	Ethical mailbox	Xnet	civil society
	Fab labs (ateneus de fabricacion)	ayuntamiento de Barcelona	local government
21		ayuntamiento de Barcelona	local government
22	Fab Labs inthe Technology Park	Barcelona Activa	local government
	Innovative public procurement	ayuntamiento de Barcelona	local government
23		ayuntamiento de Barcelona	local government
24	Internet 4 all	organizaciones del tercer sector	civil society
		Sónar+D	Company
		IN(3D)USTRY de Feria Barcelona	company
		revista Make:	company
		Soko Tech	company
		la Obra Social "la Caixa"	financial institution
		Fab Lab Barcelona	knowledge
		IaaC	knowledge
25	Maker Faire Barcelona	Ayuntamiento de Barcelona (Comisionado de Tecnología e Innovación Digital)	local government

	Making the neighbourhood:		
26	maker district	ayuntamiento de Barcelona	local government
27	Municipal control panel	ayuntamiento de Barcelona	local government
	Open & Agile Digital		
28	Transformation Toolkit	ayuntamiento de Barcelona	local government
		ayuntamiento de Barcelona	local government
29	Open budget	Aragon open data	public company
		ayuntamiento de Barcelona	local government
30	Open data challenge	pequeñas y medianas empresas	company
	Open Data portal (Open	Open Knowledge fundation	civil society
31	Data BCN)	ayuntamiento de Barcelona	local government
		ayuntamiento de Barcelona	local government
32	Open software	GitHub	company
33	progressive web apps	ayuntamiento de Barcelona	local government
34	Sentilo	ayuntamiento de Barcelona	local government
		vecinos, entidades y colectivos	civil society
35	Superblock	ayuntamiento de Barcelona	local government
36	Technology and gender	ayuntamiento de Barcelona	local government
		mobile world capital barcelona	civils society
		mobile world congress (GSM)	company
		smart city expo-fira barcelona	company
		trovit	company
		caixa bank	finacial institution
		generalitat de catalunya	government
		datahack	knowlege
		kschool	knowlege
	Technology and	ayuntamiento de Barcelona	local government
37	innovation events	barcelona activa	local government
	Technology and		
38	innovation incubator	Barcelona Activa	local government
		ayuntamiento de Barcelona	local government
		Ferrocarrils de la Generalitat (FGC)	public company
		metro	public company
		rodalies Renfe	public company
		TMB	public company
39	T-mobilitat	Tram	public company

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40	> Sentilo	1	1	1			1	4						1			1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

Barcelona Digital City projects analysis									DIMENSIONS																																								
									Smart Governance				Smart Economy				Smart Mobility						Smart Environment						Smart People					Smart Living															
									PROJECT ACTIONS																																								
	Project	gov	eco	mob	env	peo	liv	TOTAL	SGo1. Participation	SGo2. Transparency and information accessibility	SGo3. Public and Social Services	SGo4. Multi-level governance	SGo5. Community building and urban life management	SGo6. Efficiency in municipal management	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global interdependencies	SEc4. Productivity	SEc5. Flexibility and conciliation in labor market	SMo1. Accessibility	SMo2. Clean, non-motorised vehicles	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and environmental monitoring	SEn2. Energy efficiency	SEn3. Urban planning and urban refurbishment	SEn4. Smart buildings and building renovation	SEn5. Resources management	SEn6. Environmental protection	SPe1. Awareness rising and behavioural change	SPe1. education and digital training	Spe2. Research	SPe3. Creativity	SPe4. ICT - Enabled working	SPe5. Inclusive society	SLi1. Culture and leisure	SLi2. Healthcare	SLi3. Security	SLi4. Technology accessibility	SLi5. Welfare & Social inclusion	SLi6. Public spaces management	SLi7. Tourism				
1	Open budget	1						1	1																																								
2	Digital Market	1	1					2					1	1		1																																	
3	Ethical mailbox	1					1	2	1	1	1	1		1																																	1		
4	Digital identity	1						1		1	1																																						
5	Municipal apps			1		1	1	3		1	1																											1	1	1	1	1				1			
6	Open software	1	1				1	3	1	1	1			1	1																								1	1	1	1	1						
7	Transformation with agile methodology	1	1			1		3		1	1			1		1																		1															
8	Internet 4 all			1		1	1	3		1				1											1									1												1			
9	Bicing	1		1				2													1	1												1															
10	Superblock	1		1	1		1	4	1				1								1	1				1				1																	1		
11	T-mobilitat	1		1				2			1			1								1																											
12	Sentilo	1	1	1	1		1	5		1				1				1							1		1							1															
13	Open data challenge	1	1			1		3	1	1			1	1	1	1	1																																
14	City Data analytics office	1				1		2		1				1																					1	1													
15	Municipal control panel	1						1		1																																							
16	Open Data portal (Open Data BCN)	1				1		2		1	1																								1	1													
17	DECODE	1		1		1		3	1	1		1	1												1									1			1												
18	CityOS	1	1	1			1	4						1				1							1																								
19	Big Data for Public Policies	1				1		2		1				1																					1														
20	Technology and innovation incubator	1	1			1	1	4					1			1	1	1	1	1															1												1		
21	Digital Social Innovation Programme (DSI4BCN)	1	1			1	1	4	1				1			1	1	1																1	1			1								1			
22	Digital Technology entrepreneurship	1	1					2					1			1	1																				1												
23	BCN Industry 4.0 Hub	1	1			1		3					1			1	1	1																	1														
24	Fab Labs inthe Technology Park	1	1			1		3					1			1	1	1																	1			1								1			
25	Maker Faire Barcelona		1			1		2							1			1																	1	1		1	1										
26	Making the neighbourhood: maker district	1	1		1	1	1	5				1	1		1	1	1												1					1	1										1	1			
27	Innovative public procurement	1	1				1	3			1			1		1		1																															1

28	Technology and innovation events		1			1	1	3						1		1																1				1				1					
29	Challenges and rewards	1	1				1	3			1			1	1	1	1																					1							
30	Ecosystem of innovation	1	1			1		3	1			1	1		1		1																1		1										
31	Educational events	1	1			1	1	4				1		1		1																	1		1	1			1	1					
32	Cibernàrium		1			1	1	3						1	1	1																		1				1	1						
33	Fab labs (ateneus de fabricacion)	1	1			1	1	4	1	1		1		1	1	1																1	1	1	1	1			1	1					
34	Vincles					1	1	2																									1					1	1						
35	Digital education and digital social inclusion		1			1	1	3						1																				1	1				1						
36	Digital commons for social inclusion	1	1			1	1	4	1			1		1	1																	1	1						1	1					
37	Declaration of Barcelona for digital social inclusion	1				1		2				1																				1		1											
38	Decidim barcelona	1						1	1	1		1	1																																
39	Technology and gender		1			1	1	3									1																1								1				
	TOTAL	31	23	8	3	24	20	2,79	10	16	9	4	16	14	17	14	14	2	2	0	2	3	0	0	4	1	1	0	2	0	0	0	15	14	2	9	2	11	5	1	1	12	13	2	2
		gov	eco	mob	env	peo	liv	AVERAGE NUMBER OF DIMENSIONS PER PROJECT	SGo1. Participation	SGO2. Transparency and information accessibility	SGO3. Public and Social Services	SGo4. Multi-level governance	SGO5. Community building and urban life	SGO6. Efficiency in municipal management	SEc1. Innovation	SEc2. Entrepreneurship	SEc3. Local & Global Interconnectedness	SEc4. Productivity	SEc5. Flexibility and co-creation in labor	SMo1. Accessibility	SMo2. Clean, non-polluted actions	SMo3. Public Transport	SMo4. Multimodality	SMo5. Logistics	SMo6. ICT Infrastructure	SMo7. Traffic management	SEn1. Network and environmental	SEn2. Energy efficiency	SEn3. Urban planning and urban refurbishment	SEn4. Smart buildings and building renovation	SEn5. Resources management	SEn6. Environmental protection	SEn7. Awareness rising and behavioral change	SPe1. education and digital training	Spe2. Research	SPe3. Creativity	SPe4. ICT - Enabled working	SPe5. Inclusive society	SLI1 . Culture and leisure	SLI2. Healthcare	SLI3. Security	SLI4. Technology accessibility	SLI5. Welfare & Social inclusion	SLI6. Public spaces management	SLI7. Tourism
Barcelona Digital City projects analysis	PROJECT ACTIONS																																												
	Smart Governance										Smart Economy					Smart Mobility					Smart Environment					Smart People					Smart Living														
	DIMENSIONS																																												

Barcelona Smart City Challenges analysis		1. CLIMATE CHANGE						2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS							4. GLOBAL URBANIZATION						5. ECONOMIC INSTABILITY						6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES									
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.
1	> eAdministration																1				1	1		1	1											1	1						
2	> Virtual Citizen's Advice Office																1				1	1		1	1																		
3	> Portal for Procedures																1				1	1		1	1																		
4	> Open Data BCN																1	1	1		1	1		1	1												1	1					
5	> Cloud BCN – Multi-council Open Data																1	1	1		1	1	1	1	1												1	1					
6	> Telecare								1	1			1											1	1																		
7	> Radar								1	1			1																														
8	> BCN links								1	1																																	
9	> mSchools								1	1			1																								1	1			1		
10	> Smart Vegetable Garden	1		1			1		1	1			1																								1	1			1		
11	> Infantium								1	1			1																								1	1			1		
12	> The city I want to live in								1	1			1				1	1	1																		1	1			1		
13	> Libraries								1	1			1																														
14	> Culture notebook																						1		1																		
15	> mobileID																1				1																1	1				1	
16	> Organic Waste Recycling	1	1	1		1																																					
17	> Green points	1	1	1		1																																					
18	> LIVE Electric Vehicle																																										
19	> Telecontrolled watering	1	1	1																																							
20	> Telecontrolled ornamental fountains	1		1																																							
21	> Smart Grid	1	1	1																																							
22	> Hot and Cold Network	1	1																																								
23	> Empty spaces (Pla buits)	1	1	1		1																	1			1	1																
24	> Superblocks	1		1			1	1															1				1	1															
25	> Board of Public Services and Infrastructures	1				1		1									1				1																						
26	> Bicing	1		1	1				1	1					1								1					1															
27	> New Bus Network	1		1	1				1	1					1								1			1													1				
28	> School pathways	1		1																				1				1															
29	> Smart traffic lights	1		1																																		1			1		
30	> Smart Parking																																										
31	> Micro-platforms for goods deliveries	1		1																				1				1										1			1		
32	> ApparkB	1		1																																		1			1		
33	> App&Town								1	1																												1			1		
34	> Barcelona Growth																														1	1	1	1	1			1			1		
35	> Smart City Campus																														1			1	1					1			
36	> Bit Habitat																1					1															1			1			
37	<u>barcelona startups map</u>																														1			1	1			1			1		
38	> Spark Lab																1				1	1		1			1									1				1			
39	> CityOS																1	1			1	1		1			1									1	1				1		
40	> Sentilo								1								1	1	1			1		1						1							1	1					
41	> Barcelona Cloud - Multi-council Open Data								1								1	1	1			1	1													1	1						
42	> Shared innovation centres								1																						1				1	1					1		
43	> CICs								1								1				1	1								1				1	1					1			
44	> New Telecommunications Network																							1			1										1	1					
45	> Antenna Plan								1	1														1			1				1				1	1				1			
46	> Barcelona WIFI								1															1			1									1	1						
47	> Contactless Barcelona																							1			1									1	1			1			
48	> Apps4BCN																							1			1										1	1					

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

[illegible]

Barcelona Digital City Challenges analysis		1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS							4.GLOBAL URBANIZATION							5. ECONOMIC INSTABILITY							6. TECHNOLOGY DRIVEN APPROACHES TO URBAN ISSUES														
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.							
	Project																																																		
1	Open budget																1	1	1		1	1																													
2	Digital Market																1				1	1								1	1	1	1																		
3	Ethical mailbox																1	1	1	1																															
4	Digital identity																1			1																															
5	Municipal apps																1		1																																
6	Open software																1		1	1		1																													
7	Transformation with agile methodology																1		1	1		1									1	1																			
8	Internet 4 all								1	1	1		1	1	1																1			1																	
9	Bicing	1			1	1			1	1					1									1					1																						
10	Superblock	1			1				1	1														1			1	1																							
11	T-mobilitat																							1			1																								
12	Sentilo								1								1	1	1			1		1			1																								
13	Open data challenge																1	1	1			1									1				1																
14	City Data analytics office																1				1	1																													
15	Municipal control panel																1				1																														
16	Open Data portal (Open Data BCN)																1	1	1		1	1		1	1																										
17	DECODE																1	1	1		1	1																													
18	CityOS																1	1			1	1																													
19	Big Data for Public Policies																1	1			1	1																													
20	Technology and innovation incubator																															1	1		1	1															
21	Digital Social Innovation Programme (DSI4BCN)								1								1	1		1				1				1																							
22	Digital Technology entrepreneurship																																1	1		1	1														
23	BCN Industry 4.0 Hub																1		1		1											1	1		1	1															
24	Fab Labs inthe Technology Park																1	1	1					1	1																										
25	Maker Faire Barcelona																																1	1	1		1	1													
26	Making the neighbourhood: maker district								1	1					1	1								1	1			1	1	1	1	1																			
27	Innovative public procurement	1															1					1										1	1	1																	
28	Technology and innovation events																							1			1																								
29	Challenges and rewards																1		1		1	1		1			1					1	1			1															
30	Ecosystem of innovation																1	1	1		1	1																													
31	Educational events								1				1											1			1																								
32	Cibernàrium								1						1																																				
33	Fab labs (ateneus de fabricacion)																1	1	1		1	1		1	1																										
34	vincles								1				1											1	1	1																									
35	Digital education and digital social inclusion								1	1			1																																						
36	Digital commons for social inclusion																1					1		1	1																										
37	Declaration of Barcelona for digital social inclusion								1	1					1		1					1																													
38	Decidim barcelona																1	1	1	1		1																													
39	Technology and gender								1					1																																					
TOTAL		3	0	2	1	0	1	1	11	5	1	0	4	2	5	2	25	12	16	5	12	18	0	14	6	3	3	3	3	1	18	10	4	7	12	6	0	1	34	27	2	2	16	12							
		1.	1.1.	1.2.	1.3.	1.4.	1.5.	1.6.	2.	2.1.	2.2.	2.3.	2.4.	2.5.	2.6.	2.7.	3.	3.1.	3.2.	3.3.	3.4.	3.5.	3.6.	4.	4.1.	4.2.	4.3.	4.4.	4.5.	4.6.	5.	5.1.	5.2.	5.3.	5.4.	5.4.	5.5.	5.6.	6.	6.1.	6.2.	6.3.	6.4.	6.5.							
Barcelona Digital City Challenges analysis		1. CLIMATE CHANGE							2. SOCIAL POLARIZATION							3. NEED FOR NEW GOVERNANCE MODELS							4.GLOBAL URBANIZATION							5.5">5																					

Annex 5: Application to the Mediterranean Region

SMART CITY PROJECTS DEVELOPMENT GUIDELINES

After understanding the framework of urban challenges for the south and east Mediterranean Region, specific guidelines for the development of Smart City projects can be developed. Governance plays a key role in order to reach success in the development of Smart City Projects and Initiatives (Castelnovo et al., 2015; Meijer & Bolivar, 2015), and its importance regarding urban challenges in the region has been confirmed. The three years experiences of the ASCIMER project have led to the development of a framework of Governance Know-how. Gathering the collected knowledge from the Field visits developed (See Annex 2), of the Best Practices selected for the ASCIMER final event and of the Focus Groups, recommendations for the implementation of the Smart City projects have been developed.

A framework of Governance knowhow has been developed in order to organize these gathered knowledge and extract conclusions that can be useful for stakeholders involved in the development of the Smart City Projects.

Governance know-how

Figure 68: Governance framework and stages of Smart City Projects Development.

These Governance know-how framework divides the development process in 4+1 steps:

1. Concept & Design. Is the first step of the process, and as the departure point all the following steps must be included in the design perspective
  2. Financing. It is key for the project to get adequate funding regarding the objectives it pursues.
  3. Implementation. Is the core of the development of the project, where the concept is transformed into a reality.
  4. Management. Once the project has been implemented, it has to be put into operation and management becomes them the key for assuring its correct functioning.
- Finally, the transferability phase is a future step that takes place in order to develop new projects in new contexts and with new objectives.

Across all these steps, stakeholders' involvement is key for good governance and a special attention will be paid to this aspect along the description of guidelines.

The recommendations for the development of Smart City projects in these steps have been classified and summarized in 9 key guidelines. These guidelines will serve as a reference though the different steps in order to provide a useful structure for the use of this guide.

1. **Stakeholders' involvement & tasks definition.** Stakeholders should be involved in every step of the process and their tasks should be clearly defined.
2. **Multilevel governance.** It is important to take into account the different levels and scales of stakeholders, tools and projects and the relationships established among them.
3. **Citizenship involvement & social inclusion.** Among the stakeholders, Citizenship play a key role in Smart City Projects development, and social inclusion becomes therefore a key objective.
4. **Monitoring & adaptive management.** It is necessary to track the results of the project during its development and to propose changes in the process regarding the results and risks.
5. **Innovation & technology.** Innovation can be included in the different steps as new approaches and tools, including technology when necessary.
6. **Externalities & mediation.** When developing a project it is important to take into account the possible externalities of the project and mediate among the different stakeholders involved,
7. **Capacity building & knowledge transferability.** The development of new skills among the different stakeholders is key for the success of the project. Transference of knowledge among participants in different projects and among experts belonging to different areas becomes a key instrument for the development of the project.
8. **Image, credibility & positioning.** Smart city Projects are developed in a city and affects it image and credibility, and can lead to changes in their positioning in international benchmarking. This factor is also key for the development of new projects (i.e. it can make easier the recalling funding) as well as for transferability.
9. **Sustainability & efficiency.** Sustainability aspects must be taken into account in the whole development process of a Smart City Project. Social, economic and environmental aspects must be taken into account, as well as a long-term vision to make it sustainable in time. Efficiency in getting the objectives with the adequate resources is key for reaching this sustainable approach.

The interactions between these key ideas and the different phases of the project have been identified in order to summarize the steps that are going to be developed in this guide.

		IDENTIFIED KEY IDEAS								
		1. Stakeholders involvement & tasks definition	2. Citizenship involvement & social inclusion	3. Multilevel governance & legal frameworks	4. Sustainability & efficiency	5. Externalities & mediation	6. Monitoring & adaptive management	7. Innovation & technology	8. Capacity building & knowledge transferability	9. Image, credibility & positioning
STAGES OF SMART CITY PROJECTS DEVELOPMENT	Concept&Design	X	X	X	X	X	X	X	X	X
	Financing	X	X	X	X	X	X	X	X	X
	Implementation	X	X	X	X		X	X	X	X
	Management	X	X	X	X	X	X	X	X	X
	Transferability	X	X		X	X	X	X	X	X

Table 47: Connections between Stages of Smart city Projects Development and identified key ideas. X(dark blue)= conclusions extracted from Focus Groups, x (light blue) =Conclusions extracted from field visits

STAKEHOLDERS INVOLVEMENT

The identification of stakeholders is key for understanding their role in the Smart City. For this purpose, a Conceptual Model has been developed in order to show in a comprehensive Diagram how does a Smart City work.

a) Smart City Model

In the first year, ASCIMER project defined a model explaining how is the smart city conceptualized and understood. In this model, the Smart City appears as the integration of the different dimensions: Governance, Economy, Environment, Mobility, People and Living (Rudolf; Giffinger et al., 2007; Monzon, 2015). (Fig. 69)

Figure 69: Smart City Dimensions articulated by ICT

In this stage of the process it is key to understand the place that stakeholders must have in this model and what are their roles in the Smart City. For this purpose, a conceptual model has been developed in order to explain the role and relationships of different groups of stakeholders that operate inside the city (internal stakeholders)

b) Internal stakeholders

Stakeholders have been placed at the core of the model, following the theories of different authors ((Castelnovo et al., 2015; Chourabi et al., 2012; Lee & Lee, 2014) and the conceptual models of Fernández-Güell et al. (2016). Among them, Citizens have been represented as the very core of the Smart City. Their demands can be expressed directly or through the internal stakeholders, different groups of stakeholders that are interacting inside the Smart City (Fig. 70).

Figure 70: Internal stakeholders performing in the Smart City

The different groups identified have been:

- Municipal government: conformed by the local politicians and public servants working for the city.
- Local economic agents: which includes all private companies of different sizes that operate at a city level (from the small shop to the big company located in the city).
- Local Social Agents: in this group all local organizations (ONGs, CBOs, neighbourhood associations, etc) are included.
- Local RD+I. All research groups from social researchers to universities, including also research department in companies, play a key role in the Smart City fostering innovation.

All this groups are represented as over-posed, as one person is, first of all a Citizen, and besides can belong to one or more of the other groups.

The challenges described at the beginning of this document are posed by all these stakeholders groups. The Smart City appears as an answer to the challenges posed by the stakeholders. In this diagram (Fig. 4) the Smart City is represented again by the interaction of the different dimensions of Governance, Economy, Environment, Mobility, People and Living.

c) External stakeholders

Stakeholders inside the city are not the only ones to be taken into account. There are external stakeholders, groups at another scales outside the city that are key for the development of the Smart City (Fig. 6).

Figure 71: Internal and External Stakeholders in the Smart City.

The groups that have been included in this diagram (Figure 71) have been:

- Political institutions: in the framework of the Mediterranean Region, the most important political institutions to be taken into account are the ones of the Central Government. However, other institutions like the European Union or the United Nations can also play an important role in the development of the Smart City by producing guidelines and recommendations, and also by means of cooperation.

- Networking institutions: institutions that are dedicated to international relationships among National Governments and local governments. Examples in the Region would be Union for the Mediterranean and Medcities.

- Social Organizations: International Social Organizations can play a key role in the development of the social aspects of the Smart Cities. International NGOs like the Red Cross work at an urban level and can be involved in the processes that lead to a Smart City.

- Innovation and Research institutions: Universities and research centres that are working at an international level can play a role in the development of Smart Cities in the Region and the transferability of knowledge. For example, this work has been developed by the Transport Research Centre of Universidad Politécnica de Madrid and has involved members from Lebanon National University, Hassan I University, Politecnico di Milano, Vienna Technical University, Lyon University, etc.

- Financial Institutions: obtaining funding is key for the development of Smart City Projects, Therefore, it is important to take into account the involvement of financial institutions at National or International level (like the European Investment Bank, the World Bank or the French Cooperation Agency).

-Involved companies and clusters: At a national or international level, the role of big companies (IBM, Cisco, etc) and of clusters (like e-Madina Cluster in Morocco) must be taken into account. Also their interactions with the local entrepreneurial tissue and the approach of fair completion are going to be topics to be taken into account according to these stakeholders groups.

d) Relationships among smart cities

Finally, the City can establish relationships with other cities (Fig 72) in order to collaborate and for transferability of projects. This relationships can be developed directly or through the different stakeholders and institutions operating at national or international level.

Figure 72: Relationships among Smart cities and possible roles of stakeholders as intermediaries.

SURVEY: A survey has taken place among participants in the 3rd ASCIMER workshop "Governance of Smart City Projects in the Mediterranean", as explained in Chapter 2. They have evaluated the importance of the different stakeholders groups in the defined stages of development of Smart City Projects. In order to reduce the number of questions, Internal and external organizations belonging to different groups have been evaluated together. Therefore, 3 groups have resulted: Social organizations (*Social organizations + local Social Agents*), Knowledge Institutions (*Innovation and Research Institutions and Local RD+I*) and Economic agents (*Involved Companies and Clusters and Local Economic Agents*). The difference between Municipal Governments and external Political institutions has been maintained as considered to be key for the evaluation of the governance framework.

3.1. CONCEPT & DESIGN

In the **“Concept & Design”** stage, different recommendations have been collected along the ASCIMER experience. These recommendations have been organized in the 9 identified guidelines groups.

1. Stakeholders' involvement & tasks definition.

- **Joint design and stakeholders' integration.** Joint design is key in order to make stakeholders feel they are part of the Project. A tool for stakeholders' involvement can be to organize a committee or a board of people with different backgrounds. They have to be present since the beginning, not only through consultation at the end of the process but through participation in decision making processes.

- Shared vision among stakeholders. It is important to build a general vision of the project together in order to reach specific goals. This factor is key because not everybody can be in every part of the plan, so a shared vision will help to reach a result according to the opinions of all stakeholders involved.

- Political decision and political will: there has to be a commitment among the political leaders to lead the project all along its stages. This is a key factor to start, especially in locations where starting a project is very difficult if there is not a strong political will.

- Leadership as an asset. Having a leader with enough authority, someone who is really motivated to reach the goal can be a great asset for the success of the initiatives. It can either be a person or an institution.

2. Citizenship involvement & social inclusion.

- Participatory processes involving citizenship. It is key to involve citizenship in the stage of design in order to adapt the design to their needs promoting ownership of the project.

- Initiatives need to be driven by social needs. These needs have to be identified in the first steps of the design in order to address them. Social organizations are very important for this purpose, because they put social needs as a priority and therefore become a key agent to detect social needs.

- Temporality as a critical element to take into account. Implementation of urban projects can take a long time and citizenship can lose confidence. Short-term projects annex to the main project that guarantee short term results can be an alternative that support involvement in a long-term process.

3. Multilevel governance and legal framework

- Considering existing legislation. It is key to adjust the proposal to existing legislation (at national, regional and municipal) since the design phase. When designing the cooperation models among stakeholders.

- Correspondence with existing strategies at local, regional or national levels. Not only the legal frameworks have to be taken into account, but also strategic plans developed for the city, the region or the country.

3. Sustainability & efficiency

- Efficiency and profitability of the project: the project has to meet the objectives defined, and, regarding profitability, it has to produce results (not necessarily economic results).
- Viability of the project: the project needs to be viable taking into account the political support, the economic viability and the existing human resources. The project must have a proper investment according to the selected objectives.
- Sustainability: considering since the beginning of the project aspects of sustainability and how is it going to be addressed in the next steps. Sustainability during time is key since the design steps
- Concept bankability. This must be taken into account since the first stages of the process, before applying for financing. Financing institutions need to be involved since the beginning of the project, at the design stage.

4. Externalities & mediation.

- Balancing-mediation: It is key to achieve a balance among stakeholders and mediation tools and figures (i.e. external agents) are an important element to be included in this phase.
- Need to take into account designs externalities. Even if balance is tried to be reached, sometimes it is impossible to have everybody on board, sharing the same vision. There can be people that will not agree or that will have to suffer the negative consequences. Therefore it is important to take them into account and plan compensatory measures since the beginning of the project.

5. Monitoring & adaptive management.

- Addressing the challenges. The design has to take as a departure point a careful analysis of the main challenges the city has to face in order to provide answers to the. The project has to meet the needs, especially social needs, of the population.
- Defining objectives. Specific objectives need to be clear and well defined since the beginning. It is key to define the objective in order to know how to measure the success of the process.
- Defining how to evaluate the success of the project. It is important to set effective indicators in order to monitor and manage the project.
- Iterative process of design: Adapting the design of the project to the needs of the different stakeholders require an iterative process in which ideas are presented and modified in a circular process before reaching a consensus.

6. Innovation and Technology

- Not technology driven + not private interests driven. Once objectives have been defined, it is important to be sure of that the selected technologies are the best for

reaching the identified objectives, distinguishing between the common interests and the seller interests. Otherwise processes can be driven by technology or by private interests.

- Innovative concepts. The project has to be innovative since the conception. Considering since the beginning of the project aspects of innovation and how is it going to be addressed in the next steps.

7. Capacity building and knowledge transferability

- Taking into account other experiences from other contexts and countries and international benchmarking in order to find references to be adapted to the context and needs of the project.

8. Image, Credibility and positioning

- Considering previous/future image. Understanding the image that the city provides and its effects can help to design a project that overcomes its limits and takes advantages of the positive aspects. It is also important to understand how can the project affect the future image of the city.

SMART CITIES: IMPLEMENTATION VS: DISCOURSES

STAKEHOLDERS INVOLVEMENT

Figure 73: Survey on stakeholders importance in the Concept and Design stage: average values

At the Concept & Design stage (Fig 73), the *Municipal Governments* group has been valued as the most important group. Political Institutions at a higher scale, Innovation and Research institutions (local and external) and social organizations and agents have been valued in a second place. The involved companies and clusters and local economic agents have been considered the less important stakeholders among the groups.

CONCEPT & DESIGN	Citizens	Municipal Governm	Political Institutions	Involved Companies and Clusters	Financial Institutions	Innovation & Research Institutions	Social Organizations	Networking Institutions
Average value	3,76	4,79	3,93	2,93	3,34	3,83	3,9	3,45
Minimum value	1	1	1	1	1	1	2	1
First quartile	3	5	3	2	2	4	3	3
Median	4	5	4	3	4	4	4	4
Third quartile	5	5	5	4	5	5	5	4
Maximum value	5	5	5	5	5	5	5	5

Table 48: Importance of stakeholders' roles in the Concept and Design stage: average value, median and quartiles (Scale 1-5).

Regarding the agreement on the responses (Table 5), the *Municipal Governments* group stands out for the great consensus among the participants when it comes to weighing it. It has received in almost all the answers a value of 5 points. In general, the evaluation of the stakeholders has been fairly homogenous at this stage, where most of them have been rated with values between 3 and 5 points. Stakeholders like *Innovation & Research Institutions* and *Networking Institutions* are also characterized by the consensus among participants, both of the being weighted with fairly high values. Stakeholders like *Citizens*, *Political Institutions*, *Involved Companies & Clusters* and *Social Organizations* do not present a similar agreement in terms of the valuation received, being much more disparate than in the previous cases. Finally, *Financial Institutions* is the stakeholder that stands out for its wide disparity of opinions.

3.2. FINANCING

Recommendations have been extracted for the financing stage. They have been grouped in the 9 different groups of ideas described.

1. **Stakeholders' involvement & tasks definition.**

- Institutional support. Regarding financing, it is important to highlight the importance of the commitment of different institutions, and especially of the national authorities. This support will be a key factor in order to get the project to be financed.

2. Citizenship involvement & social inclusion.

- Transparency of the project. The transparency in the financing plan is key to get the support of citizenship and different stakeholders in this phase.

- Citizenship involvement in financing. The introduction of new ways of financing can provide an active role for citizenship that can collaborate in projects financing increasing the feeling of ownership (see 5, Innovation and Technology).

3. Multilevel governance & legal framework.

- Adequacy of scale between the type of project and the way of financing. The funding system to be applied must be adequate to the scale of the project. The scale will also be important in order to choose the financing institutions to be involved. Local financing and shared ownership can help at small projects, and it can help in monitoring at a small scale. Also, it opens the possibilities for combinations, as National or International Financing Institutions can work with the local banks that become intermediates and supervisors (i.e. local banks can channel the money for financing that comes from the government).

- National government commitment. For getting the projects financed, it is important to get the commitment of institutions at different levels. Especially in countries where government is highly centralized, it is key to get the commitment of the national government.

4. Sustainability & efficiency.

- Financial sustainability (self-sustainability or municipal-sustainability): The project can be self-sustained, but do not necessary need to generate a revenue. It can be economically sustained by the municipal funds as it generates value in the area. This is a critical element in order to take a financial decision and must be taken into account.

5. Externalities & mediation.

- Externalities to be included in financing. Sometimes, the solution of externalities of the project is going to need a specific part of the budget (i. e. the relocation of people during development of works needs economic resources).

6. Monitoring & adaptive management.

- Managing risks. It is important to reduce the risks of the project in order to get financing. However, risks are sometimes difficult to avoid and in this case a plan for risk management can be a decisive element in this phase. The economic impact of the solution of risks needs to be taken into account.

7. Innovation & technology.

- Including new financing models (PPP, pay for services/changes, etc). These new models can be taken into consideration as an option. It is important to take into account the need for regulation regarding these new models: it will be very important to define the steps and risks, and the role of partners. Capacity building and transfer of knowledge can be key element for the success of these initiatives.

- Possibilities of new participative financing instruments (i.e. crowd financing). There exist the possibility of implementation of new financial models that allows citizenship to take an active role in financing. This possibility is not common in Mediterranean Countries at the moment, but it can be suggested as a possibility for the future.

8. Capacity building & knowledge transferability.

- Capacity building and previous experiences in financing. Applying for financing and managing it after can be a hard work and take a long time. The importance of the previous experiences is key in order to reduce the time and reach success in financing. Therefore, capacity building is of great importance regarding this stage.

- Knowledge about getting financing. There is a need of spread of knowledge about how to get financing. On the one hand, applicants for funding should have access to clear information about the process. On the other hand, the awareness of the financial institutions about the approach to this stage from the side of applicants is also key to ease the process.

9. Image, credibility & positioning.

- Cities financial credibility. Regarding their previous experiences and their current situation, cities can have a higher or lower credibility. Cities have to build their own credibility in financial aspects in order to ease their access to funding.

- Project attractiveness. In order to get financing, the project needs to be attractive, to "be cool", linked to an image of success. However, success is a relative term that can refer to economic aspects but also to other aspects of benchmarking, like sustainability, quality of life or innovation.

STAKEHOLDERS INVOLVEMENT

Figure 74: Survey on stakeholders importance in the Financing stage: average values

At the Financing stage (Fig. 74), the *Financial Institutions* group is the one considered to have a greater importance in this phase of the project. It was followed by the *Municipal Government* and *Political Institutions* at a higher scale. In this case, the economic stakeholders (*Involved companies and clusters* and *Local Economic agents*) are also considered important, being valued on average above 3. The role of *Citizens* has not been considered relevant, as well as the role of social organizations and agents and the role of *knowledge institutions* (*Innovation & Research Institutions* and *Local RD+I*). The importance of those three groups has obtained the lower values.

FINANCING	Citizens	Municipal Governm	Political Institutions	Involved Companies and Clusters	Financial Institutions	Innovation & Research Institutions	Social Organizations	Networking Institutions
Average value	1,66	3,97	3,76	3,24	4,83	1,72	1,69	2,1
Minimum value	1	1	1	1	1	1	1	1
First quartile	1	4	3	2	5	1	1	1
Median	2	4	4	4	5	1	2	2
Third quartile	2	5	5	4	5	2	2	3
Maximum value	4	5	5	5	5	5	4	5

Table 49: Importance of stakeholders' roles in Financing stage: average value, median and quartiles (Scale 1-5).

When it comes to the agreement in the responses (Table 6), *Financial institutions* have not only obtained the highest score in almost all the answers of the survey but also by the indisputable agreement among participants in the survey. There exists a great agreement also in the groups of *Citizens*, *Municipal Governments*, *Knowledge institutions (Innovation & Research Institutions and Local RD+I)* and *Social Organizations (at both scales)*, emphasizing the *Municipal Governments* group, as it has obtained a highest score compared to the other three, which have been considered less relevant in this phase. Stakeholders like *Political Institutions* and *Networking Institutions* have maintained a certain consensus, although it is lower compared to the other stakeholders. However, it is the *Political Institutions* group the one presenting the most disparity of opinions, where most participants consider it quite relevant, while another large group gives it little importance.

3.3. IMPLEMENTATION

In the **“Implementation”** stage, different recommendations have been collected along the ASCIMER experience. These recommendations have been organized in the 9 identified key ideas.

1. **Stakeholders' involvement & tasks definition.**

- Responsibility and tasks definition. Tasks to be assumed by each stakeholder participating in the implementation, as well as the responsibility of the different actions (and possible failures) need to be defined to reach success in implementation.
- Leadership and coordination. There is a need of coordination among stakeholders. Having a clear leadership eases the project implementation process.
- Procurement (i.e. PPP) Procurement is key issue for the implementation of the project. There is a need of defining the relationships between government and private companies. Another key issue would be to provide clear directions of what is needed to private companies, in order to get proper goods and services procurement

2. Citizenship involvement & social inclusion.

- Continuous process. The process of involvement and awareness must take place during the development of the project and be continuous.

3. Multilevel governance & legal framework.

- Creating ad-hoc companies or local development companies for major projects. Creating a company to carry the project can help to achieve a more efficient implementation. These can also be local development companies with sectoral specialization. Another option will be to create local development companies with sectoral specialization that can cooperate with stakeholders for certain project.
- Legal framework is a key issue for procurement in the implementation stage that must be both taken into account and in some cases modified or adapted.

4. Sustainability & Efficiency.

- Fair competition (fostering local development). A focus on sustainability in this phase will be key, in this key allowing local companies to compete for procurement, or even promoting their participation in the project.

5. Externalities & mediation.

- Managing externalities. It is important to take into account the possible negative and positive externalities and include in the financial plan how are they going to be balanced.

6. Monitoring & adaptive management.

- Monitoring the implementation. Monitoring this phase will be key for two reasons. Firstly, it is key to increase efficiency, adapting the process to the changes in the development. Secondly, it is key for future transferability.

- Risk management and contingency. There is a need of risk management regarding the possible problems appearing during implementation. This kind of problems are usually affecting the economic aspects and there is a need of contingency for keeping the budgets as planned.

7. Innovation & technology.

- Innovation in implementation. New approaches will need an innovative implementation in order to succeed. This phase is also an interesting stage for using new technologies in the project.

- IT tools for awareness and transparency of the process. Information and communication plays a key role for citizenship involvement and technology can be very helpful in this aspect.

8. Capacity building & knowledge transferability.

- Transference of knowledge in implementation: In this phase is key to look at other experiences in the field. It is important to contact experts and stakeholders with experience in the implementation of similar projects in order to reach success in this phase.

9. Image, credibility & benchmarking. (not considered as key in this stage)

STAKEHOLDERS INVOLVEMENT

Figure 75: Survey on stakeholders importance in the Implementation stage: average values

The Implementation phase of the project (Fig 75) is characterized by having a smaller disparity among the average importance attached to the different stakeholders groups. It is the group of *Municipal Governments* that perhaps becomes more important in this phase of the project, being the Economic agents (*Involved Companies and Clusters* and *Local Economic Agents*) have been considered as the most important group in this stage. They are followed in importance by *Financial Institutions*, *Political institutions* at a higher scale and *Citizens* as considered to have a medium importance I this stage. The groups considered to have a lower importance have been the *Networking institutions*, followed by *Social organizations* and agents and *Knowledge Institutions (Innovation and Research Institutions and Local RD+I)*.

IMPLEMENTATION	Citizens	Municipal Governm	Political Institutions	Involved Companies and Clusters	Financial Institutions	Innovation & Research Institutions	Social Organizations	Networking Institutions
Average value	2,76	4,31	2,72	4,03	3,1	2,41	2,48	2,21
Minimum value	1	1	1	1	1	1	1	1
First quartile	2	4	2	3	2	1	2	1
Median	3	5	3	4	3	3	2	2
Third quartile	3	5	4	5	4	3	3	3
Maximum value	5	5	5	5	5	5	5	5

Table 50: Importance of stakeholders' roles in the Implementation stage: average value, median and quartiles (Scale 1-5).

When studying the consensus reached in the responses (Table 7), Municipal Government has evaluated with the highest possible score by the majority of participants reaching the higher consensus. The groups of *Citizens* and *Social Organizations&Local agents* have reached a high consensus in the evaluation of their importance. However, according to the weighting received we can see that they are not considered as very relevant groups in this stage. Stakeholders like *Political Institutions*, *Involved Companies & economic agents*, *Financial Institutions* and *Networking Institutions* have maintained a certain consensus, although it is lower compared to the other stakeholders. However, it is the Knowledge Institutions group (*Innovation and Research Institutions and Local RD+I*) that presents the higher disparity of opinions, where most participants consider it to be quite relevant, while another large group barely attaches importance to it.

3.4. MANAGEMENT

In the **“Management”** stage, different recommendations have been collected along the ASCIMER experience. These recommendations have been organized in the 9 identified key ideas.

1. **Stakeholders' involvement & tasks definition.**

- Role of city manager in management. Usually municipalities are the ones leading Smart City Projects. However, the City Manager can be not only a leader but a facilitator for other options of management.

- Framework for coordination among stakeholders. It is necessary that all stakeholders involved in management can cooperate to get the results each of them expected. It is key to create a framework for coordination in the management stage, as it is a long-term stage.

- Management has to return to local authorities. Once the project is finished it should return to local authorities. However, they do not always have the financial capacity and/or skills to support the infrastructure. In this case different possibilities could be explored: temporary management by other stakeholders and capacity building for the municipal authorities.

2. Citizenship involvement & social inclusion.

- Information and awareness of the management process. Citizen should be informed about the management process and about their possibilities of interaction and collaboration. i.e. accessibility and operability of information captured by sensors in the city, where different stakeholders can propose locations and manage the results.

- Feedback process. It is important that information does not only follow one direction. Citizenship needs to be listened and their needs understood, as a key step to reach social equity.

- Citizenship involvement in management (shared management). There are alternatives of shared management among stakeholders in which citizenship play an active role in a part or the complete management process. i.e. managing gardens in neighborhood, coordinating part of the activities, etc.

3. Multilevel governance & legal framework.

- Creating ad hoc companies for major projects. Creating a company to carry the project can help to achieve a more efficient implementation. These can also be local development companies with sectoral specialization.

- Legal framework. The development of a legislative and regulatory framework for the management of the projects can be an asset in order to reach success in this stage.

4. Sustainability & efficiency.

- Linking this project phase to the others. Maintaining this phase linked to the others, either continuing the core ideas or the process, can lead to increases in the efficiency and ease sustainability during time.

5. Externalities & mediation. (not considered as key in this stage)

6. Monitoring & adaptive management.

- Project update and upgrade (continuous). An important factor in management is the possibility /capacity of continuous project upgrade.

- Adaptive management. Management itself (not only the project) needs to be flexible changing during the process and oriented to problem solving.

- Management monitoring. Monitoring of the management process and results can help to support project upgrade and adaptive management.

- Procurement and management. Procurement solutions must also be applied in the management phase. (see recommendations in the implementation phase)

7. Innovation & technology.

- Role of research for risk solutions. The problems that an initiative has to solve are sometimes unexpected and even new. Cooperation with research institutions can help to solve these new problems or find new solutions for existing ones.

- Need of new financial models. Sometimes existing financial models are not adapted for Smart City Projects management. Multi-stakeholder approaches to management become also a great challenge regarding financing in the management stage. Therefore, new solutions must be found and disseminated.

8. Capacity building & knowledge transferability.

- Capacity building for municipalities or for other stakeholders. It is key for the management of the Smart City Projects to develop specific capacity building programs for the management stage, both for municipalities and for other stakeholders.

9. Image, credibility & positioning.

- The role of benchmarking (also linked to supporting organizations). Benchmarking can be a good way to compare experiences and extract conclusions to improve management. Networking organizations can help to share experiences with other cities to provide a better management. This topic is linked to the next stage: transferability (as there should be a transfer of management experiences)

STAKEHOLDERS INVOLVEMENT

Figure 76: Survey on stakeholders importance in the Management stage: average values

In the Management stage (Fig 76) *Municipal government* are considered to be the most important stakeholders. Economic agents (*Involved Companies and Clusters* and *Local Economic Agents*) constitute the second group regarding the importance of their role, being rated almost one point lower than the first group. More than a half point below, *Citizens* is considered the third group in importance in this phase. The rest of the groups have a similar weighting, being *Networking institutions* the group rated as less important.

MANAGEMENT	Citizens	Municipal Governm	Political Institutions	Involved Companies and Clusters	Financial Institutions	Innovation & Research Institutions	Social Organizations	Networking Institutions
Average value	2,69	4,17	2,38	3,24	2,31	2,24	2,38	2,07
Minimum value	1	1	1	1	1	1	1	1
First quartile	2	3	2	2	1	1	1	1
Median	3	5	2	3	3	2	2	2
Third quartile	4	5	3	4	3	3	3	3
Maximum value	5	5	5	5	5	5	5	5

Table 51: Importance of stakeholders' roles in the Management stage: average value, median and quartiles (Scale 1-5).

Management phase presents a certain uniformity in the answers obtained (Table 8). We can only see a greater agreement on the weighting of the stakeholder groups of *Political Institutions*, although it is not considered the most relevant of the phase. The groups of *Municipal Governments* and *Financial Institutions* are the ones which show the greatest disparity of opinion. The rest of the groups have also reach a certain consensus, although having been assigned different importance.

3.5. TRANSFERABILITY

In the **“Transferability”** stage, different recommendations have been collected along the ASCIMER experience. These recommendations have been organized in the 9 identified key ideas.

1. **Stakeholders’ involvement & tasks definition.**

- Political institutions engagement as key stakeholders. The engagement of political institutions in transferability is key because sharing their experiences can be an asset for present and future projects.
- Dialogue among cities. The communication among cities is key to encourage transferability of projects. To establish dialogue frameworks is a key issue.
- Role of specific networking institutions. The specific role that networking institutions develop is key for stakeholders involvement and also to help to coordinate and define tasks in the transferability phase.

2. Citizenship involvement & social inclusion.

- **Making the experience “cool”.** Making the project attractive can be an asset for transferability, especially among citizenship. It is not only marketing, but the way of experiencing the project itself, finding it close and useful.

3. Multilevel governance & legal framework (not considered as key in this stage)

4. Sustainability & efficiency.

- Sustainability in time and durability. It is key to evaluate the sustainability in time and the durability in order to promote the transferability of projects. It is a key factor to take into account.
- Adaptation to local conditions. When a project is transferred it has to be adapted to local conditions in order to reach the maximum sustainability and efficiency. The local conditions, the resources and skills of the participant stakeholders and the needs of the population will establish the guidelines for a correct transferability.
- Importance in the direction of the transferability (north-south or South-south). Another important factor to guarantee the success in transferability is going to be to take into account the difference of transferability among Regions. There have been already many lessons learned in the transference north-south that must be taken into account if we don't want to repeat the same mistakes.

5. Externalities & mediation. (not considered as key in this stage)

6. Monitoring & adaptive management.

- Registration of the history and process of the projects. Learning lessons from the past projects can help for upgrading the future ones. Collecting the main steps of the process

and the actors' participation is key. It is very important to collect information not only about results, but also about how are results obtained.

- Research regarding process/results. Research in the relation between the process and the results becomes key in order to provide a solid base for transferability, to understand if a project works and why.

- Monitoring and evaluation. The evaluation of the results of the process, collected through monitoring, is key for transferability. This way, weak and strong points can be identified and modifications introduced in future projects. Benchmarking can help to understand the results of evaluation.

7. Innovation & technology.

- Research dissemination. Innovation and technology can help in the transferability phase as they create an interest that can help to dissemination. If Research centres or universities, as well as RD+I department of companies, are involved they can help to spread the knowledge in the forums they participate in.

8. Capacity building & knowledge transferability.

- Knowledge transference through networking and capacity building. Involving experts, who have already worked in implementing the same or similar projects elsewhere, is important to increase the probability of succeeding (reviews of experts, site visits, networking activities, companies that already have previous experience in the field). It is important to establish requirement this requirement of the previous experience for applying for procurement and also for the application of the projects to other locations.

- Repetition factor: the repetition of a project can be an indicator of its success. However this idea has to be balanced with the results of monitoring.

- Transferability of the experience in getting financing. It is important to share knowledge in how to get financing for projects among organizations involved. It is a stage that becomes crucial and sometimes it is difficult to get information about it.

9. Image, credibility & benchmarking.

- Marketing (benchmarking). A key factor for transferability is to promote the city, the product, by itself or by comparing it to others through benchmarking.

- Transparency, accessibility and dissemination of information. For increasing the credibility of the city and for allowing benchmarking, there is a need of accessibility of information and the possibilities and quality of dissemination has to be upgraded.

STAKEHOLDERS INVOLVEMENT

Figure 77: Survey on stakeholders importance in the Transferability stage: average values

In the Transferability phase (Fig 77), the differences among the average weights assigned to the different stakeholders group are not very wide. *Networking institutions* and *Knowledge institutions (Innovation & Research Institutions and Local RD+I)* are the groups values with a higher importance. They are followed by the Economic agents (*Involved Companies and Clusters and Local Economic Agents*) and *Political Institutions*. *Citizens* and *Social Organizations and Agents* are the groups considered to have a lower importance in this stage.

TRANSFERABILITY	Citizens	Municipal Governm	Political Institutions	Involved Companies and Clusters	Financial Institutions	Innovation & Research Institutions	Social Organizations	Networking Institutions
Average value	2,46	3,14	3,17	3,21	3,14	3,59	2,55	3,52
Minimum value	1	1	1	1	1	1	1	1
First quartile	1	2	2	2	3	3	1	2
Median	2	4	4	3	4	4	3	4
Third quartile	4	5	4	4	4	5	3	5
Maximum value	5	5	5	5	5	5	5	5

Table 52: Importance of stakeholders' roles in the Transferability stage: average value, median and quartiles (Scale 1-5).

In the Transferability phase, it is worth mentioning some uniformity and homogeneity in the answers obtained (Table 9). Only *Financial Institutions* present a greater agreement, being also considered among the most relevant groups of the phase. The groups of Economic agents (*Involved Companies and Clusters and Local Economic Agents*) and Knowledge institutions (*Innovation & Research Institutions and Local RD+I*) have also reached consensus, although it is a little lower. It is the *Political Institutions* and *Social Organizations&agents* the groups presenting more disparity, where *Political Institutions* are given more importance than *Social Organizations*, as it has being weighted with higher values in the survey. Finally, *Citizens*, *Municipal Governments* and *Networking Institutions* are the stakeholders which stand out in this phase because of their wide disparity of opinions. There are some assessments that revolve around 1 or 2 points, while others reach the maximum possible score in the survey.

Annex 6: Articles and Conference papers published

Publications:

- Smart City Projects Assessment Matrix: Connecting Challenges and Actions in the Mediterranean Region. FERNANDEZ-ANEZ, Victoria; VELAZQUEZ, Guillermo; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. 2018. Journal of Urban Technology.
- Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf. (2017). Cities. <https://doi.org/10.1016/J.CITIES.2017.12.004> (Published online). For the printed version: Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf. (2017). Cities, 78. 4-16.
- Incorporating a Systemic and Foresight Approach into Smart City Initiatives: The Case of Spanish Cities. FERNÁNDEZ-GÜELL, J.-M., COLLADO-LARA, M., GUZMÁN-ARAÑA, S., & FERNÁNDEZ-ÁÑEZ, V. (2016). Journal of Urban Technology, 1–25.
- Stakeholders approach to smart cities: a survey on smart city definitions. FERNANDEZ-ANEZ, Victoria. (2016) First International Conference, Smart-CT 2016, Málaga, Spain, June 15-17, 2016, Proceedings, Lecture notes in Computer Sciences, 9704 pp. 157-167, 2016.
- How to incorporate urban complexity, diversity and intelligence into smart cities initiatives FERNÁNDEZ GÜELL, José Miguel; GUZMÁN ARAÑA, Silvia; COLLADO LARA, Marta; FERNANDEZ-ANEZ, Victoria. (2016) First International Conference, Smart-CT 2016, Málaga, Spain, June 15-17, 2016, Proceedings, Lecture notes in Computer Sciences, 9704 pp. 85-94, 2016.
- Movilidad inteligente. PÉREZ PRADA, Fiamma; VELÁZQUEZ ROMERA, Guillermo; FERNÁNDEZ ÁÑEZ, Victoria; DORAO SÁNCHEZ, Javier. (2015). Economía Industrial, 395, 17-28.

Conferences:

- Ciudad inteligente y visión integrada: Barcelona, Milán y Viena. FERNANDEZ-ANEZ, Victoria; FERNÁNDEZ-GÜELL, José Miguel; GIFFINGER, Rudolf, POLETTI, Angela. (2018). Libro de Comunicaciones. IV Congreso Ciudades inteligentes. Madrid, 30-31 de Mayo 2018. Publicación
- Procesos de gobernanza en proyectos de Ciudad Inteligente en un contexto internacional. Metodología de Análisis. FERNANDEZ-ANEZ, Victoria; MONZÓN DE CÁCERES, Andrés; VELAZQUEZ, Guillermo; RAMIREZ, María. (2016). Libro de Comunicaciones. II Congreso Ciudades inteligentes. Madrid, 13-14 Abril de 2016. Publicación

- Addressing urban challenges: Smart City assessment within a Regional context. FERNANDEZ-ANEZ, Victoria; VELAZQUEZ; Guillermo; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. En: 56th ERSA Congress Cities & Regions: Smart, Sustainable, Inclusive? 23-26 August 2016, Vienna, Austria.
- Smart city assessment methodologies: an opportunity for more sustainable cities. FERNANDEZ-ANEZ, Victoria. En: 56th ERSA Congress Cities & Regions: Smart, Sustainable, Inclusive? 23-26 August 2016, Vienna, Austria.
- Stakeholders approach to smart cities: a survey on smart city definitions. FERNANDEZ-ANEZ, Victoria. (2016) Smart CT, Málaga 14-15th June 2016
- How to incorporate urban complexity, diversity and intelligence into smart cities initiatives FERNÁNDEZ GÜELL, José Miguel; FERNANDEZ-ANEZ, Victoria; GUZMÁN ARAÑA, Silvia; COLLADO LARA, Marta. (2016) Smart CT, Málaga 14-15th June 2016
- Smart City Assessment: a holistic approach to urban diversity. FERNANDEZ-ANEZ, Victoria. (2015) Vienna Young Scientists Symposium. 9-10th June 2016
- Proyectos inteligentes y Gobernanza en la región Mediterránea. VELAZQUEZ; Guillermo; FERNANDEZ-ANEZ, Victoria; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés. (2016). Libro de Comunicaciones. II Congreso Ciudades inteligentes. Madrid, 13-14 Abril de 2016.
- Smart Cities Definition: discourses and Stakeholders. FERNANDEZ-ANEZ, Victoria. (2015). International Conference on City Sciences. Tongji University. June 2015 – Shanghai. Ponencia.
- Buenas Prácticas en Ciudades Inteligentes: Respondiendo a los retos urbanos FERNÁNDEZ ÁÑEZ, Victoria; PEREZ PRADA, Fiamma; MONZÓN DE CÁCERES, Andrés; TORREGROSA SANTANA, Andrea (2015). Libro de Comunicaciones. I Congreso Ciudades inteligentes. Madrid, 24-25 de Marzo de 2015.

Paper version: The most important conferences and papers are included in the next pages.

Digital version: The most important conferences and papers are included in an attached folder.