THE SMART CITY IN DEVELOPING COUNTRIES

A sustainable development model in Latin America and the Caribbean

KNOWLEDGE CITY

TALENTED CITY

ECO CITY

SUSTAINABLE CITY

SMART CITY

INTELLIGENT CITY

DIGITAL CITY

WIRED CITY

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ABSTRACT

Cities are complex systems that occupy a minimum area at the physical level but have a high impact on the environment, thus they should direct efforts towards an urban sustainable development; in that sense, the smart city model is based on the investment in the social capital, technology and efficient use of resources for the enhancement of sustainability and to improve the livability of cities. Although the concept has been a topic of discussions between researchers in western countries, literature does not clearly distinguish the difference on the approach in developing countries that are most vulnerable to urbanization challenges, with limited economic resources and urgency for new solutions.

Meanwhile, Latin American and Caribbean cities are expected to grow in the next years most of them will reach the condition of megacities. They also have urgent tasks to tackle such as access to social housing, inclusion of dismissed areas, security, corruption on institutions, resource management and citizen participation as well. Even if the region is responsible for a small quantity of gas and waste emissions at a global level, it has a big environmental vulnerability, so cities are changing their urban agenda and aiming efforts towards urban sustainability, some of them including the concept of smart city in their digital agenda and helping to construct an integrated vision of the city. The model represents a valid tool to overcome some actual urban sustainable challenges and it could embrace citizens to a more active position, transforming themselves from passive spectators into active actors towards the development of their cities.

In the present thesis, the smart city will be explained as a model to reach urban sustainability in developing Countries, but considering that smartness cannot be approached the same in developed countries due to the different goals in urban management, target and problems. It will explore some urban innovations in the region of Latin America and the Caribbean that has been labelled as one of the most promising communities in terms of urban expansion, social development and that represents a potential target for ICT companies as a market for smart technologies. Through the method of tracking and mapping urban innovation projects, it will be presented the different areas of interventions, policy strategies and alignments that cities are focusing on. Furthermore, the internal synergies of the cities and their particular needs have produced many smart initiatives that are simply based in terms of technology but that represent a valuable solution and the real re-adaptation of the smart concept considering the complexity and context of the city. Therefore, the

experience of Lima in Perú will be explained as an example in which the collective intelligence is the way to achieve smartness.
Keywords: Smart city, Sustainability, Developing countries, Latin America and the Caribbean, Collective intelligence.

CONTENTS

STRUCTURE OF THESIS

The present thesis is divided into 03 parts and 07 chapters:

Part 01: The smart city as a model of urban sustainability

The first part is an introduction to the actual problem of urbanization and the challenges for sustainability, presenting some actions and policies developed in order to tackle some urgent problems. Then, the smart city model is explained, doing a small review on the literature, the performance, the opportunities and challenges it might bring; it is explained how it is possible to achieve sustainability through smartness.

Part 02: The smart city in developing countries

Some statistics are presented in order to justify the focus in one of the most promising regions in terms of urbanization, population and density, the Latin America and the Caribbean. Also, there is a timeline of the cities that have hosted some global relevant events towards sustainability as the COP 20 and Habitat III.

In the same line, a list of the initiatives developed towards the smart city model is presented, doing a distinction with the generic model adapted in cities and the context-based solutions that surge from the collective intelligence.

Part 03: The collective intellingence of Lima, Perú

The case of Lima is presented, and some simple technology innovations are explained as a result of the intern synergies that cities have and that are to produce smart solutions.

Finally, there is a critique about the role of technology as an enabler for smartness and the need to include the community in the construction and development of the vision of the smart city which is translated into a long-term and complex process.

ACKNOWLEDGEMENTS

INTRODUCTION

According to Low and Satterthwaite, in the process of urbanization cities can be both producers and consumers of richness, but also creators of environmental waste (Hollands, 2008); the perspective of development includes an urban economy based, first, on the production of knowledge and, second, on the capability of cities to attract new talents such as those of professionals and skilled persons (Capitani, 2017). Since the city itself is a complex system, so-called "system of systems" (Naphade, Banavar, Harrison, Paraszczak, & Morris, 2011), if it remained traditional it would be destined to die, however, it should direct its efforts through a more sustainable development and the use of technologies can be a valid tool towards a smart transformation.

Smart city model and groups of urban innovation are quite widespread concepts in Europe (Paskaleva, 2011); the concept has become very popular after being part of the European research funding mechanism (Vanolo, 2016), through information platforms and experience exchange that allow continuous learning between cities, like Smart-Cities.net that promotes urban sustainable development in Asia and European cities (Hollands, 2008). Nevertheless, areas labelled as on-going development, are facing big social and urban challenges but they can also be turned into opportunities.

Cities in Latin America and the Caribbean are expected to grow in the next years, most of them changing into megacities (United Nations, Department of Economic and Social Affairs, 2014; United Nations, 2016), but they also have urgent pending tasks to tackle such as access to social housing, inclusion of dismissed areas, security, corruption on institutions, as well as citizen participation (Bouskela, Casseb, Bassi, De Luca, & Facchina, 2016). This, even though the region had hosted several worldwide events related to sustainability and climate change as The United Nations Climate Change Conference in several countries with the aim to enhance the global nations to mobilize the green economy and enable low carbon development. Some years ago, The United Nations Conference on Housing and Sustainable Urban Development – Habitat III held in Quito, Ecuador, on October 2016, has discussed the implementation of the New Urban Agenda and doing special emphasis in the goal 11 which is related with the smart city.

The concept of the smart city is a broad and unclear that needs to be discussed and adapted to the needs of the context; and with the method of mapping and tracking urban initiatives, some cities stand out in the region as innovators. Therefore with a qualitative and quantitative method is possible to identify the smart approach that cities are taking, and that represent a way to sustainability development; for example, the Brazilian case of Curitiba with the Bus Rapid Transport and Medellin in Colombia that focused on the social inclusion with the integration of public space with the transport network. Also, it is important to explore the specific and context based solutions that arise from the citizen network that, by using simple based technology, is able to tackle with specific problems thus producing positive impact on the society.

PART 01

SMART CITY AS MODEL FOR URBAN SUSTAINABILITY

1. SUSTAINABILITY

Cities can be both producers and consumer of richness, but they can also be responsible of environmental waste (Hollands, 2008); they occupy a minimum area at the physical level but with a high impact on the environment. It is since the industrial revolution and the shift of activities, from agriculture to manufacturing services (Costantino, 2015) that people started migrating to the cities at an exponential speed, a phenomenon that marked important disparities between the city and outskirts; industrial and post-industrial communities tend to live in dense urban areas due to the principle of accessibility, demand and production networks (Capello, 2016). As an example, urban citizens income is three times the income of the rural citizen (Estevez, Lopes, & Janowski, 2016); people living in compact and dense cities tend to have a smaller energy footprint, because it requires a compact and better infrastructure, consuming fewer resources and having higher productivity levels.

Today almost half of the population of the world is located in urban agglomerations, likewise megalopolis or small province cities (United Nations, Department of Economic and Social Affairs, 2014); geographically Asia has 53% of the world's urban population, followed by Europe at 14%, and Latin America and the Caribbean at 13% (Estevez et al.,

2016). Megacities with over 20 million inhabitants will be the ones with fastest population rise and by 2030 there will be 41 megacities with more than 10 million inhabitants (UN, Bocquier, 2005).

From 30% in 1950 to 54% in 2014 the prevision of urbanization level worldwide is of 66% in 2050; thus, sustainable development challenges will affect particularly the lower-middle-income countries; the crisis comprehends also models in the lifestyle, thus social and cultural aspects are the principal factors that have a negative impact on the urban and metropolitan system. Because of that, it is important to review the consolidated models of government and planning in the territory, in order to change the methods and strategies of intervention that are inadequate to tackle the contemporary city problems and integrated policies to improve both urban and rural populations (Costantino, 2015). But with a clear understanding of the components that contribute to the changes in the city; there are three elements (Dall' Ò, 2014) that are strongly interrelated because if one changes, inevitably the others will change as well: the economy, the society, the environment. Each one must have an active role in the city and constitute the dimensions of urban development that shape the urban agenda of the last decades.
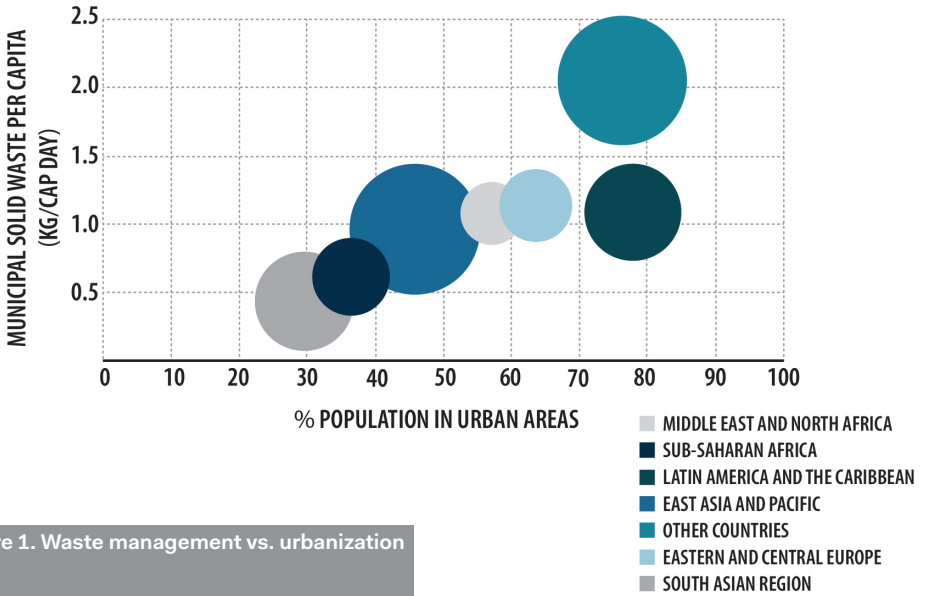
Figure 1. Waste management vs. urbanization rate.

Legend:
- MIDDLE EAST AND NORTH AFRICA
- SUB-SAHARAN AFRICA
- LATIN AMERICA AND THE CARIBBEAN
- EAST ASIA AND PACIFIC
- OTHER COUNTRIES
- EASTERN AND CENTRAL EUROPE
- SOUTH ASIAN REGION

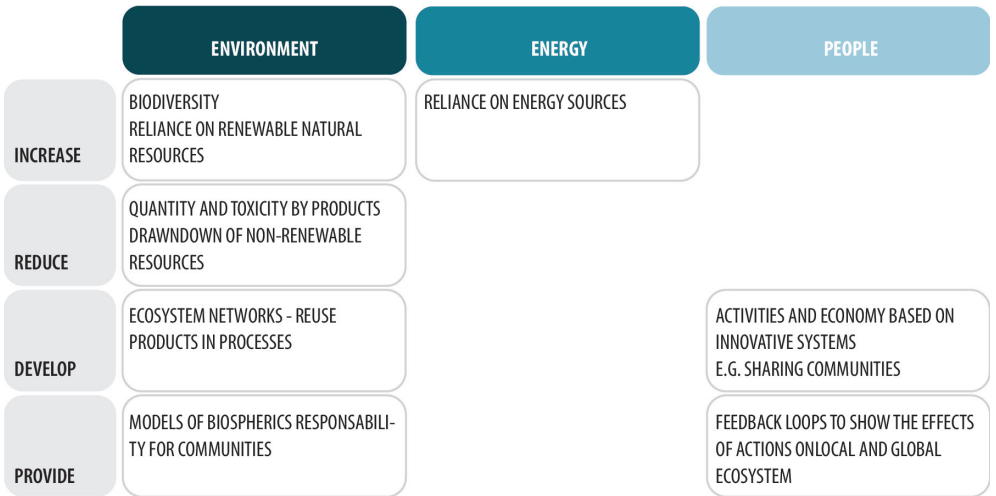|	ENVIRONMENT	ENERGY	PEOPLE
INCREASE	BIODIVERSITY RELIANCE ON RENEWABLE NATURAL RESOURCES	RELIANCE ON ENERGY SOURCES	
REDUCE	QUANTITY AND TOXICITY BY PRODUCTS DRAWNDOWN OF NON-RENEWABLE RESOURCES		
DEVELOP	ECOSYSTEM NETWORKS - REUSE PRODUCTS IN PROCESSES		ACTIVITIES AND ECONOMY BASED ON INNOVATIVE SYSTEMS E.G. SHARING COMMUNITIES
PROVIDE	MODELS OF BIOSPHERICS RESPONSABILITY FOR COMMUNITIES		FEEDBACK LOOPS TO SHOW THE EFFECTS OF ACTIONS ONLOCAL AND GLOBAL ECOSYSTEM

Figure 2. Sustainability Matrix according to Polyakov.

1.1

URBAN SUSTAINABILITY

The term "sustainable" refers to the characteristic of an element to last in time; "development" is a qualitative measure, a trajectory that an area follows explained by social and economic factors. In economic terms it is associated with the conditions of life (Capello, 2016). Consequently, urban sustainability is the translation of the concept of sustainable development in the cities, which is a process of economic and social development that generates advantages while respecting the environment and doing use of resources in a way that they don't exhaust with time and distribute them equally, both locally and globally (Dameri & Benevolo, 2013).

The Brundtland Report (Rausa, 2017) elaborated in 1987 by the World Commission on Environment and Development (Dameri & Benevolo, 2013) introduced later the idea of sustainable development, concept which became worldwide spread: "Sustainable development is the process of change such that the exploitation of resources, the direction of investment, the orientation of technological development and institutional changes are made consistent with future needs as well as with the current ones" (Gudmundsson, Hall, Marsden, & Zietsman, 2016). Ergo, to meet the needs of the present without compromising the ability of future generations, while promoting the reduction of consumption of resources, better management of the city of them and a better quality of life for citizens.

The ground base is the planned and strategic development process towards an equilibrium of the territory, people and economy (Spaziali, 2015); in other words, to conciliate work towards a balance of forces, that usually are in conflict of interest, competing and contradicting between each other. As the society assigns different values to the economy, environment and society; sustainability is able to articulate them in a long-term goal (Bibri, 2017).

Previously, disciplines like urban planning and architecture were working on the topic in an isolated way, without translating it into the everyday life, nevertheless, it has broadened public interest (Poco, 2016). Therefore, today, different areas are collaborating and working together in order to share their experiences and learn collectively towards the progress of cities, turning communities into more resilient ones (Spaziali, 2015). That is because cities are complex systems that occupy physical space and changes the ecosystem (E. Riva Sanseverino, 2014), but adopting sustainable development can contribute to reducing the human footprint impact on the ecosystem.

1.2
OBJECTIVES

To achieve sustainability is necessary to generate an equilibrium in three dimensions: the environment, the economy and the society; experts agree that the interrelation of those three forces is important both for their interdependence and the equal importance they have in shaping cities as well (Spaziali, 2015).

The environmental sustainability means to understand the impact on physical space, the territory; and its limited capacity of the ecosystem to support life (Bibri, 2017; R. Riva Sanseverino, 2015) and to achieve that it is important to design adequate strategies that are able to change human behaviour towards sustainable consumption patterns; i.e. the preservation, the resilience and the adaptation of the natural systems on a long-term basis (Abdel-Galil, 2012) and also to create systems that are able to manage and monitor the biophysical constraints (Bibri, 2017).

The economic sustainability entails the identification and adoption of management systems to use the resources available (Bibri, 2017); thus, the consumption of stock in an efficient optimal and responsible way while generating a maximum flow of economic welfare (Poco, 2016), it means to have more benefits with less environmental costs (Capello, 2016).

The social sustainability is people oriented and is identified with the stability and cultural diversity of social systems towards equity and social inclusion; also, to the fact that citizen must be conscious of their behaviour and of the natural environment and to have respect for the future generation needs.
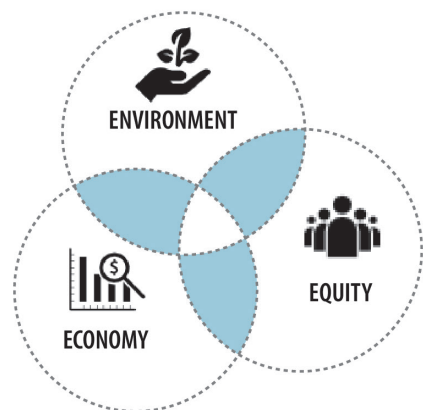

Figure 3. Three dimensions of urban sustainability.

1.3

URBAN POLICIES

Even if environmental changes affect all communities without exception, directly or indirectly in both developed and developing areas, there are some differences that can be measured according to some indicators such as the ones described by Burgess (2000); for example the renewable and non-renewable resource use, energy production and demand, production of greenhouse gases, air and water pollution, solid and toxic wastes, soil degradation and erosion, conversion and removal of vegetation, impacts on biodiversity and accessibility to global resources. With time the use of practices that promote sustainability became popular, a worldwide phenomena and topic in conferences and meetings, thus organizations are dedicated in defining and setting patterns for sustainable development (Spaziali, 2015). The urban development enables communities to expand, but the paradox is that the space available on earth is limited; thus the adoption of compact and density models, can communicate the transformative power of urbanization, recognized on 40 years of global policy-making and the succession of new challenges (United Nations, 2016).

In 1976, the Vancouver Declaration described uncontrolled urbanization as a problem leading to overcrowding, pollution and general deterioration of living conditions in urban areas. In 1987, the Brundtland Report established the basis for sustainable development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 2016). In 1992, the Local Agenda 21 -LA 21, together with the declaration of the UN Conference on Environment and Development in Rio de Janeiro, helped to shape the Agenda 21 which highlighted the need for sustainable settlements as well as the conservation and management of resources for development and participatory decision-making. Later in 1996, the Istanbul Declaration, made emphasis on the importance of the local dimension to achieve sustainable urban environments. The International Kyoto agreement in 1997, was the product of the conference COP 3 held by the UNFCCC, United Nations Climate Change Conference [1]; where 180 countries reunited to debate and find solutions about the environment and especially on climate change. The movement marks a before and after the focus of the policies in almost all nations (Dall' Ò, 2014).

In 2012, the UN Conference on Sustainable Development - Rio+20, took the topic of sustainable cities as one priority and it was discussed on the frame of the Sustainable Development Goals –

SDGs. In 2016, Habitat III produced the New Urban Agenda that should ensure an equally positive agenda for urban sustainability, with workable proposals for effective change and compliance with SDGs (United Nations, 2016).

17. PARTNERSHIP FOR THE GOALS

8. DECENT WORK AND ECONOMIC GROWTH
9. INDUSTRY, INNOVATION AND INFRASTRUCTURE
10. REDUCE INEQUALITIES
12. RESPONSABLE CONSUMPTION AND PRODUCTION

1. NO POVERTY
2. ZERO HUNGER
3. GOOD HEALTH AND WELL-BEING
4. QUALITY EDUCATION
5. GENDER EQUALITY
7. AFFORDABLE AND CLEAN ENERGY
11. SUSTAINABLE CITIES AND COMMUNITIES
16. PEACE, JUSTICE AND STRONG INSTITUTIONS

6. CLEAN WATER AND SANITATION
13. CLIMATE ACTION
14. LIFE BELLOW WATER
15. LIFE ON LAND

Figure 4. Sustainable Development Goals.

SGD 11.

SUSTAINABLE CITIES AND COMMUNITIES

11.1 ACCESS TO HOUSING, BASIC SERVICES, SLUM UPGRADE

11.2 SUSTAINABLE TRANSPORT

11.3 URBANIZATION / HUMAN SETTLEMENTS PLANNING

11.4 STRENGTHEN WORLD'S CULTURAL & NATURAL HERITAGE

11.5 REDUCE DISASTERS & PEOPLE IN VULNERABLE SITUATIONS

11.6 REDUCE ENVIRONMENTAL IMPACT OF CITIES

11.7 SAFE, INCLUSIVE & ACCESSIBLE GREEN & PUBLIC SPACES

11.A LINKS URBAN, PERIURBAN & RURAL AREAS BY PLANNING

11.B DISASTER RISCK MANAGEMENT, INCLUSION, RESOURCE EFFICIENCY

11.C SUPPORT LEAST DEVELOPED COUNTRIES IN BUILDING SUSTAINABLE AND RESILIENT

Figure 5. Sustainable Development Goal 11.

1.4

A SUSTAINABLE MODEL OF CITY

The city itself is a complex system, so-called "system of systems" (Naphade, Banavar, Harrison, Paraszczak, & Morris, 2011); places where a future is imagined. It offers extraordinary opportunities for innovation, where it is possible to test new models of development and social innovation, related to the urban environment, plus establishing a transition towards a smart society (Pozdniakova, 2017). Nevertheless, cities that ignore the new challenges and don't develop any innovative form of social and economic development, will be condemned to a slow and inexorable decline (Costantino, 2015). Against this depressing panorama, an answer to the crisis resides in the investment of innovation, research and creativity practice, to transform the contemporary city into a sustainable model and in particular the smart city[2] appears as an effort towards sustainability.

According to Jong et al. (2015), the definition of a sustainable city is complex, it is an organized system that enables citizens to meet their own needs and enhance their wellbeing without damaging the environment or compromising the living condition of people, today or in the future (Girardet, 2008). A sustainable urban form involves mobility and accessibility, energy efficiency; environmental improvement and pollution reduction; economic viability; and a society with the quality of life (Bibri, 2017). As there is not a universally accepted unique model, other derives according to the focus on the sustainable dimensions; such as green-city, resilient cities, eco-cities, knowledge cities, as well as the smart city. Additionally, the European Union had a leading role in both defining and building sustainable cities, thus organizing some conferences: In Aalborg, 1994, that had as output the approval of the Aalborg map with the guidelines and definitions of a sustainable city. The next year in Lisbon, defining the action plans for the concrete realization of the sustainable city. Lastly in Hannover, 2000, which issued the Hanover Appeal of Local Authorities, realizing a balance of the results achieved in making European cities sustainable, as well as to agree on a common line of action (Dameri & Benevolo, 2013).

So, a phenomenon that is growing attention is the application of Information and Communication Technologies – ICT and the positive impact on the governance of urban areas; thus the smart city became a new paradigm for sustainable urban development (Vajtho 2015; Caragliu et al., 2011; de Jong et al., 2015) and that has emerged as a response to the challenges and opportunities shaped by rapid urbanization (Estevez et al., 2016).

The smart city is characterised by the use of technology to make a more efficient and effective use of the resources; to promote economic growth (Rausa, 2017), a better quality for life of citizens; in short the city model is able to link competitiveness and sustainability through an integration of investments in infrastructure, management of resources, governance transparency and participation to decision-making processes (Paskaleva, 2011) with respect to prosperity, sustainability, resilience, emergency management, or effective and equitable service delivery (United Nations, 2016).

Since the role of citizens is central in both city models sustainable and smart city, it can have different connotations (Dameri & Benevolo, 2013); in one hand, the sustainable city focusses on establishing equilibrium between people generations and the distribution of economic and natural wealth; while the smart city focuses on improving the quality of life in urban areas and generation of new services. Another aspect to distinguish is the role played by technology and in particular by ICT; the most innovative and advanced technologies are aiming to work in creating smarter and better-quality cities, attractive and with a high level of livability.

EASTERN EUROPE & CENTRAL ASIA	0.35
ASIA	0.40
LATIN AMERICA & CARIBBEAN	0.50
AFRICA	0.45

Figure 6. Gini index.

URBAN GROWTH   CHANGE IN FAMILY   INFORMAL SETTLEMENTS

URBAN SERVICES PROVISION   CLIMATE CHANGE   INEQUALITY

INSECURITY   INTERNATIONAL MIGRATION
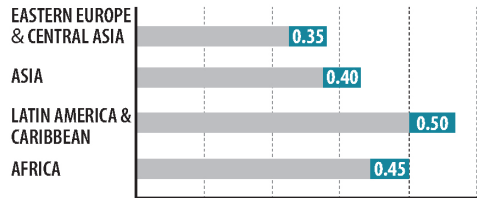
Figure 7. Challenges in urbanizing areas.

2. THE SMART CITY

The smart city seems to be the urban utopia of the century, the concept itself is not well defined and it can be associated with different visions and the idea can change meaning according to the place, but commonly it will be in relation to urban infrastructures and social dynamic transformed or improved through technologies based on information and communication (Vanolo, 2016). In that sense, there are many city models that are related to the use of technology and the approach to sustainability.

The digital city is closely linked to the use of information technology infrastructure and its implementations such as the Internet, broadband and fast connections at urban area level (Dameri & Benevolo, 2013); thus, it differs from the smart city, that sees technology as a mean to make accessible the use of city services and the citizens must be consciously aware of the advantages of the model. Also, there are some differences in the territorial and content analysis.

Intelligent city is related to smart city in the use of ICT because it can transform life and work, city and spatial territories, pull people to enhance innovation, learning processes and problem solving (Hollands, 2008; Komninos & Sefertzi, 2009); its application also helps communities to connect with local governments, schools, businesses, citizens, health and social services through the creation of new ones in order to address local objectives. Therefore, in order to transform a city into a smart one is important to balance the needs of the community, business, government and residents;and to promote social learning, education and social capital investment (Hollands, 2008).

The smart city has aspects in common with the idea of a green city that searches for a lower environmental footprint in cities, to reduce resource consumption and to improve the quality of air and water (Dameri & Benevolo, 2013). Instead of imposing rigid normative and policies about the energy saving, it is important to focus in the change of the behaviour of the citizen in terms of urban development, using tools as the collective knowledge, together with a more responsible government model. As an example of initiative there is the "transition town", a term coined in Ireland and UK in 2005, which focus on the investment on citizen education, so they can be aware of sustainable settlements and to be prepared for a community life without petroleum and small emissions of CO_2 (Dall' Ò, 2014).

Figure 8. Typical vision of smart city.

1. SOCIETY, TECHNOLOGY & MANAGEMENT

INTERNATIONAL JOURNALS

TECHNICAL + POLICY ORIENTED DOCUMENTS

2. SOCIAL SCIENCES CRITIQUE + DEBATE

NEOLIBERALISM
CORPORATE ORIENTED AND PROFIT ORIENTED
NEW FORMS OF POWER AND CONTROL
SOCIO-TECHNICAL REGIMES
BOTTOM-UP GOVERNANCE

3. «DIVERSE» SMART CITY INNITIATIVES

SMART CITY PROJECT CASES
USE AND NEGOTIATION OF NEW TECHNOLOGIES

Figure 9. Strands of the Smart City literature.

2.1
DEFINITION

As a result, the present thesis focuses on the concept of the smart city as a model for urban sustainability as it is based on the investment of social capital, use of technology and the efficient use of resources for the enhancement of sustainable development and improvement of the quality of life of citizens.

According to Dameri & Benevolo (2013), there is an explosion of publications about the smart city, that exceeds the term of digital cities, due to the interest of international policies and government. Also, The European Union had launched different calls and programs towards the promotion of smart initiatives, the same that generate interest on researchers between locals and transnational businesses. The research of Hollands (2008) offers a wide range of concepts of a city that made use of infrastructure technologies or ICT to perform its functions in a more effective and sustainable way. It involves three main elements and assumes their interrelation: intellectual capital that is related to the production of knowledge, the social capital thus network and human relations; and infrastructure technology which all combined create an interconnected network that enables the smartness. There are other scholars that impartially explores the definitions, dimensions and performance of the

smart cities that rather than clarify the concept, show that definitions lack universality (Albino, Berardi, & Dangelico, 2017). Vanolo (2016) explains the genealogy of the smart city as a product of an accumulation of pre-existing urban imaginaries that can be mentioned in two groups: the first one is related to policies and planning ideas from North America especially on smart growth framed on the eighties New Urbanism framework; while the second one is inherent to the concept of intelligent city. Although the general literature on smart cities can be categorized in three strands, both in urban studies and social sciences. First, there is a large body of literature between social, technological and managerial studies that focuses on the potential benefits and benefits of the implementation of smart technology. Second, an increasing number of debates in social sciences emphasize the link with neoliberalism, corporation's orientation and profitability behind projects. The third group, a new one, explores urban initiatives and analyses the way in which technologies are used, negotiated and sometimes subverted by citizens (Vanolo, 2016).

Some movements promote more intelligent cities through local initiatives like living labs as platforms for collaboration and innovative market for citizens, companies and researchers

(Komninos & Sefertzi, 2009). Moreover, technology companies have developed specialized software (Paskaleva, 2011): CISCO and its intelligent urbanization program use the network for integrated city management, economic development and better quality of life for citizens; Microsoft has the intelligent city proof of concept, an interoperable technology platform focused on transport; IBM and its smarter cities program stimulate economic growth and quality of life through the activation of new approaches, thinking and acting on the urban ecosystem; it has also supported innovation programs in Latin America cities (Mcneill, 2015).

In fact, the concept has changed in time and the actual trend focus on the investment on social capital that together with infrastructure technology can empower people into participation and decision processes (House-Ambrosetti, 2013). Thus, to transform cities a shift on thinking is necessary and leaders must work, collaborate in multiple levels of government, building relationships among different systems to solve long-term problems (Zhuhadar, Thrasher, Marklin, & de Pablos, 2017).
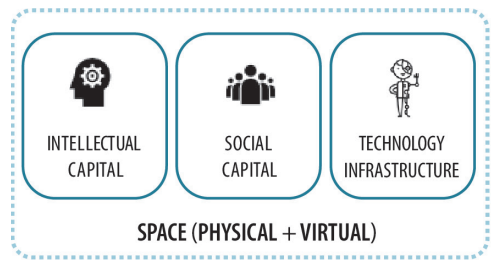

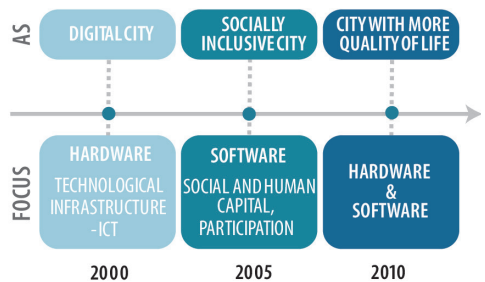**Figure 10. Elements of the Smart City.**

Figure 11. Evolution of the concept of the Smart City.

2.2
CHARACTERISTICS

According to Costantino (2014), it is important to have a comprehensive and integrated approach to the smart city, in order to reach its goals. Thus, it has the following characteristics:

It requires projection, because it is able to generate medium long-term urban visions and design strategies for development; it plans the territory through an integrated management and multiples level of coordination for resources; and needs the commitment of diverse actors.

It is competitive and attractive, the smart city goes along with the international tendencies of finance, economy and culture while putting in value the human resources and local to global competences; it can generate urban services that made it attractive for investors and emergent business, as well as creative people in innovation and research sectors. It is creative, and it offers the conditions for the citizen to think, design and project their ideas while helping to the change to renew competences and local development. As an example, neighbourhoods turn into laboratories and develop customized products, also called fab labs[3].

It is slender, it aims to reduce waste generated in the mass production and optimizing the process and services flow, so it searches for low budget investment projects based on savings and efficiency. It is collaborative, it promotes all kinds of collaboration between actors, preferring savings and socialization: Collaborative Consumption, Sharing Economy and Peer Economy, and others that show multiplicity such as, co-housing, co-working, open source, crowdfunding, social streets.

It is inclusive and participative, it is in favour of the citizen involvement in decision-making and rethinking the relation between government and citizen and promoting new collaborations. Some examples are: open government, e-democracy, public contest, co-design. It is sensible, transforming and creating new conditions for the infrastructure to support the technology for monitoring, sensor networks: Internet of Things – IoT[4] and Big data[5].

It is resilient, so communities can understand the impact of their actions in the environment through education and communication, so they can be prepared to react in case of eventualities. It is related to the cloud because it provides funding, infrastructure and a politic project to promote the empowerment of the local community, i.e. an enabling city; which promotes the collaboration and social experimentation in the public space, both physical and virtual.

Smartness can have a big range of applications and those will be related to sectors of the city and can reflect the different target and goals

of implementation. The differences reside in the approach of the research dimension was produced and by who, that means the academia or the industry (Caragliu, Bo, & Nijkamp, 2009).

The six traditional pillars of the city model are:

- Smart economy, related to the cooperation between public and private actors and development of social incubators and entrepreneurship.
- Smart mobility; the use and development of technology in favour

of urban mobility.

- Smart environment; monitoring of energy consumption, promotion of the use of renewable sources and reduction of CO2 emissions.
- Smart people, creating network and communication for data sharing, security and protection of sources.
- Smart living, related to co-design, implementation of living labs and co-working.
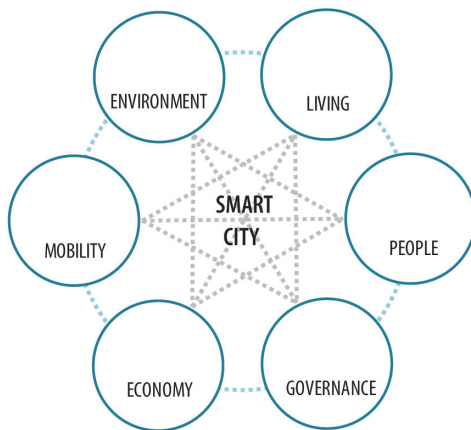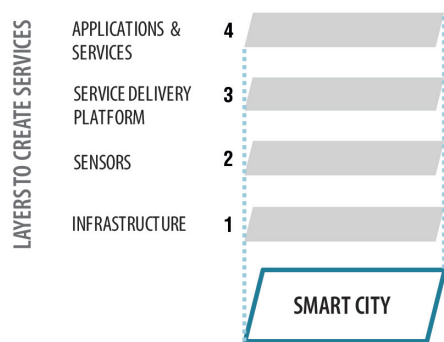- Smart governance, motivating citizens in the involvement of public decisions.

Figure 12. Dimension of the Smart City.

Figure 13. Levels of articulation of the Smart City.

2.3
APPROACH

The smart city model is a tool to achieve urban sustainability and according to the (United Nations, 2016) "a sustainable city has to achieve a dynamic balance among economic, environmental and socio-cultural development goals, framed within a local governance system characterized by deep citizen involvement and inclusiveness"; that idea is explicit in the Sustainable Development Goal number 11, that aims to "make cities and human settlements inclusive, safe, resilient and sustainable". But the term smart has been quoted in two points only: the 66th relates with digitalization, clean energy and technologies as promoters of environmentally conscious choices made by inhabitants and booster of sustainable economic growth; while in 121st, smart-grid systems and community energy plans should aim to improve synergies between renewable energy and energy efficiency (Habitat III Secretariat, 2016). In the same context, according to the Europe 2020 strategy, cooperation between different institutions is needed to stimulate three types of growth: smart growth through the development of an economy based on knowledge, research and innovation; sustainable or green growth which promotes resource-efficient and competitive market; and inclusive growth with policies that foster job creation and poverty reduction (Nabielek, Hamers, & Evers, 2016). Those can be achieved through better

planning and management of the cities, i.e. through the smart and resilient cities; systems that are productive and environmentally sustainable, moving from a traditional economy to made use of clean energy and knowledge.

It represents a powerful tool that can help the proper management of the available resources on cities and improve the quality of life of its inhabitants; when the model place people at the centre of the process and actors network, the development is able to incorporate ICT into urban management and make use of them to stimulate the design of a new form of government, giving form to a new relationship government-citizen through the promotion of inclusion, collaborative planning and participation. Consequently, the smart city will be able to promote an integrated and sustainable development, to improve the quality of life and turn the city into one that is innovative, competitive, attractive and resilient (Bouskela et al. 2016). When questioning if smart cities make people smart or it is people that make their cities smart; the director of Smart Cities New York, highlights the importance of enhancing people and empowering them into decision-making processes, so they can believe that change is possible and collaborate to the transformation, while being aware that urbanization needs technology in order

to improve quality of life. In that context, smart cities educate their people to make them the dreamers and makers of the future; both entrepreneurs can create new solutions, as well as people in innovative neighbourhoods, creating solutions that can achieve local scale impact. Basically, investing on a citizen is a key goal of the transformation process; since basic education, so students can be aware of the new advantages of ICT, to higher education, with initiatives that promote universities campus and research centres. Sharing experiences between cities can make them learn from each other; one of the lessons is the need for city planning, the importance of public space and accessibility. While technological advances can help in planning, as in mobility and transport networks, government transparency and people access to ICT systems and privacy awareness. Finally, productivity and social inclusion can go along; so, cities, technology and people work together towards the achievement of sustainable development goals[6]; likewise, the promotion of local initiatives, living labs as platforms for collaboration and innovative market for citizens, companies and researchers (Komninos and Sefertzi 2009). Moreover, technology companies have developed specialized software and programs seeking for cities to give the next step (Paskaleva 2011): CISCO and its intelligent urbanization program use the network for integrated city management, economic development and better quality of life for citizens; Microsoft has the intelligent city proof of concept, an interoperable technology platform focused on transport. While IBM and its smarter cities program stimulate economic growth and quality of life through the activation of new approaches, thinking and acting on the urban ecosystem; it has also supported innovation programs in Latin America cities (Mcneill 2015).

Figure 14. Definitions of the Smart City according to approach.

2.4
EFFICIENCY

In order to measure the level of smartness in a city and also, to manage the complexity of the city, its components and targets, is necessary to identify some relevant indicators that integrate an analysis about the social welfare together with the sustainability of the urban environment and sustainability of the lifestyle of the citizens. The understanding and proper interpretation of data are suitable to govern the changes and to promote a model of society, intelligent, sustainable and inclusive; that means to know the social, economic, environmental and cultural phenomena, in other words, "if you can't measure it, you can't manage it" (Silvestrini, Vaccaro, Riva Sanseverino, & Riva Sanseverino, 2015).

Indexes have advantages and disadvantages, especially in the weight indicators are taken into consideration for the calculation, some of them can benefit the interest of the institution or business are aiming to demonstrate, thus making them subjective. For example, in some cases, technology or governance can have different importance, or the difficulty to measure some elements due to the qualitative nature (Pozdniakova, 2017), also because of the vague and broad undefinition of the smart city. Nevertheless, the different models to evaluate smartness were developed the different components of the innovation

helix with a different focus and relating the concept to mobility improvement, ICT, environment, to improve the quality of life and systems to improve the government.

In 2007 the "Ranking of European Medium-sized City" was the first ranking to the developed by the Polytechnic University of Vienna in collaboration with the University of Ljubljana and Polytechnic of Delft and it was focused on medium-sized cities. Only 70 out of 1600 analysed cites were chosen for a deeper investigation, that present similar characteristics that were comparable: population from 100 000 to 500 000 inhabitants, the field of user minor to 1.5 million and the presence of at least one university (Albino et al., 2017; Santis, Fasano, Mignolli, & Villa, 2012). The six pillar dimensions were established, and the system is recognized by the European Union (Costantino, 2014): smart economy, smart people, smart government, smart mobility, smart environment and smart living.

In 2012 "The Smart Cities Wheel" was published by the Fast Company magazine and it comprehends a study about the measurement of the smartness of European cities, conducted by an urban and environment expert, Boyd Cohen and it is based on the explanation of the six pillars settled by Vienna

University but showing indicators that could the used to assess different types of cities (E. Riva Sanseverino, 2014). In the same year, "ICity Rate" an Italian attempt to measure was conducted by società Forum PA s.r.l. that compares 100 indicators of six aspects: mobility, governance, living, environment, people and economy (Dall' Ò, 2014; R. Riva Sanseverino & Vaccaro, 2015).

"The Smart City Index" explores the diffusion of ICT, from 116 municipalities of the principal provinces of Italy, that exalts the digital services and awards the city that according to layers, is able to structure interventions in areas such as smart culture & travel, smart urban security and smart justice. It is based on:

- The evaluation of technological infrastructure
- Investigations ad hoc and data use based on institutional sources (ISTAT, MIUR)
- Analysis of thematic areas from infrastructure and broadband in digital services, and indicators on urban sustainable development

	DIMENSIONS	INDICATORS	DATA
2007 SMART CITIES RANKING OF EUROPEAN MEDIUM-SIZED CITIES	6 DIMENSIONS	74 INDICATORS	70 EUROPEAN CITIES MEDIUM SIZED
2012 SMART CITY WHEEL	6 DIMENSIONS 3 KEY DRIVERS FOR EACH COMPONENT	28 INDICATORS	10 EUROPEAN AND NORTH AMERICAN CITIES
2012/13 ICITY RATE	6 DIMENSIONS	89 INDICATORS	103 PROVINCIAL CAPITALS OF ITALY
2012/13 SMART CITY INDEX	9 DIMENSIONS: HEALTH, EDUCATION, MOBILITY, GOVERNMENT, ALTERNATIVE MOBILITY, ENERGETIC EFFICIENCY, NATURAL RESOURCES, RENEWABLE ENERGY, BROAD BAND	153 INDICATORS	116 PRIMARY PROVINCIAL CAPITAL

Figure 15. Measure experiences of the Smart City.

(mobility, renewable energy, energy efficiency and management of air, water and garbage.

The ranking is directed on the idea that the smart city should have a structure grounded on four layers:

- Infrastructure base ground, as the triggering element for the construction of a smart logic of the urban functions
- Sensor technological network interoperable, to collect big data and remote management.
- Delivery platform for the elaboration and development of big data in the territory.
- Applications and services that create aggregated value for the city.

Apart from the community and the academia, the industry has also manifested their specific way to measure smartness as "The Levels of Articulation of the Smart City" presented by Ernest & Young, which explains that the city is composed of several layers, developed one after another, and exposing the idea of a functional smart city. As base level infrastructure is composed of telecommunications, transport, energy, environment; as second level sensors are able to control lighting, detectors, security, air conditioning, heating; third layer is service delivery platform related to the readiness; dematerialization, integration and interoperation of urban services; finally, the fourth level is the application and services related to the improvement of systems of government, mobility, tourism and culture, education and health system. In addition, the success of the smart city can be analysed through two spheres, that express the transversal character of previous layers: smart citizens and livability of the city, both in quantitative and qualitative terms, and second, vision and strategy of the city (Ernst & Young Global Limited, 2016).

Nevertheless, some institutions have developed different tools to determine the changes in the cities and establishing some rankings between cities, as the case of the annual report IESE cities in motion which evaluates six components: sustainability, governance, equity, quality of life, infrastructure and productivity. Another initiative is the City Prosperity Index, a monitoring tool developed by the United Nations that allows to identify, quantify, evaluate, monitor and report the progress of the strategies made by cities and countries in relation to the Goal 11 of the Sustainable Development Goals (UN-Habitat & International City Leaders (ICL), 2015) and it considers 10 dimensions: social cohesion, governance, public management, urban planning, technology, environment, mobility, international outreach, human capital and economy.

2.5
IMPLEMENTATION

The proper use of technologies can improve the economic and politic efficiency, enable social, cultural and urban development of the city (Komninos & Sefertzi, 2009); and as related to the digital revolution, it implies data generation, infrastructure and analysis (Finger & Razaghi, 2017); but also the substitution of physical space with activities guided by digital technologies (Florio, 2017). It is worth mentioning that some structural factors of the cities can influence the implementation of the smart city model, widening the gap between the capitalized advantages of the smart city and their full potential (Estevez et al., 2016). To list some, the presence of research centres for smart cities is fundamental, so the community has a group of experts that is seeking for new solutions, enabling them to share new findings and learn about best practices. Also, to have policies that promote the development of strategies towards smart cities, a medium long-term vision of the city and connecting the already existing initiatives. However, literature does not make a clear distinction between the smart approach in developed countries and developing countries a topic that will be later discussed in the paper.

Therefore, the process of transformation of the smart city model is complex and challenging due to the difficult management of the city. It is also important that the project can embrace public value in all economic, social, ecological dimension, plus promoting the political transparency; and not to be driven by a particular ideological position or, even worse, a commercial interest (Estevez et al., 2016). It requires enough resources, actors and market demand that are easily found in metropolitan areas[7]; it can be perceived as a disadvantage for small cities. Furthermore, the constant technological innovation has enlarged the big distance between the big and medium-sized cities against the small ones (R. Riva Sanseverino & Vaccaro, 2015). Cities around the globe are implementing several solutions to improve the quality of urban services for their inhabitants while the smart city model[8] has been discussed by different research centres among universities, software and technological business and public institutions. Although there are constraints on system interoperability and data use, heterogeneous sources of quantitative and qualitative data can be provided by the open government and the citizens but there is a low capacity to connect them into analytical models. In this perspective, the roadmap towards the smart city (Bouskela, Casseb, Bassi, De Luca, & Facchina, 2016) integrates a complex and interinstitutional project that has some principles for the movement from the traditional city management.

For the success of the model it is important the participation of a visionary leader, as the mayor of the city or chief of the municipal division, that is able to reflect political support of the government and the local authorities. Some of the actions that the government should take (Gov Lab Deloitte, 2015) include:

- Develop strategies for creating an integral vision of the city to become a smart city and be advocated to transform the city into a sustainable, innovative, inclusive and resilient one.
- Direct and regulate, creating or changing regulations that foster the investment and creation of new business models, and the entry of new ICT companies that offer smart solutions, so competence and quality can be assured while protecting the interest of the citizens.
- Connect and protect the city through the development of new infrastructure, setting standards of quality and construction; for example, the implementation of transport networks, digital networks and energy grids.
- Innovator and investor, modernizing the internal organization systems, digitalization of data, capacitation and re-engineering processes.
- Provide an adequate environment that promotes the creation of new business and development of urban innovations; for example, the creation of urban labs, open data provision, enabling start-ups.
- Enable collaboration and the creation of new actor's network, between different political parties while enabling solutions towards a common advantage for the city.

Also, the initiative must be supported by a multidisciplinary team with technical knowledge and management skills that will make strategic decisions to ensure the achievement of the city model and bringing partnership of different level institutions; a group of experts and professionals to plan and monitor the project from the implementation of the pilot phase, then monitor and evaluate/measure results, learn from experimentation and improve the exchange of experiences.

To identify the critical issues of the city that need solutions but also being aware of the resources available, such as infrastructure and technology; and to propose the action plan to implement the solutions it is important to consider and promote the participation of the citizen through the creation of mechanisms to listen to the population at every stage, starting from the identification of problems, while promoting both technological and social inclusion. Also, citizens can be part of the innovative

force that demands and creates new solutions for the needs of the community and is important to invest in the social and human capital.

Some projects can be created with public funds, nevertheless it is crucial to seek for new opportunities and to establish partnerships along with the private sector, academia, NGOs, and other levels of government. It can benefit technically and fundraising. Also, competition between different technology providers can promote the innovation and improvement, independence of services and solutions by creating a high-quality smart ecosystem. Thus, once roles are defined, it helps to achieve better results, ensuring a win-win relationship between public and private sector. It also represents a good opportunity to develop start-ups and promote innovation, competitiveness, and entrepreneurship in different urban scales, from the neighbourhood to the city, the region, the country.

To sum up, adopting the smart city model can bring collective advantages and Pagani (2012) proposes four types of cities[9], in order to represent the scheme of the smart city. Taking as a base the diagram of Cipolla where the individual and collective advantages are placed in a Cartesian system; it shows the different interactions between them:
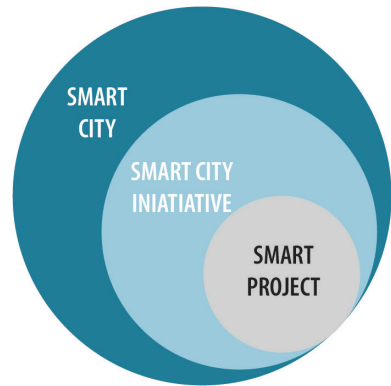
Figure 16. The smart city development.
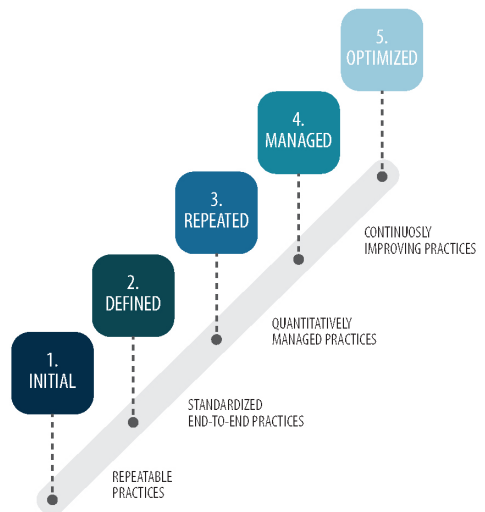
Figure 17. The maturity level of the Smart City.
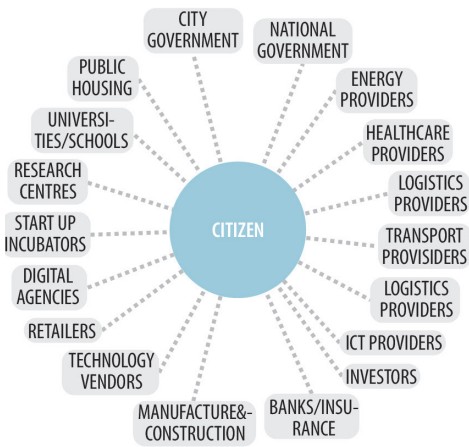
Figure 18. Smart city must consider the citizen as central in the actor's network.

Figure 19. Types of cities according to their advantages.

the dangerous city, the raider city, the pioneer city, and the smart city.

First, the "Dangerous city", as the worst scenario it produces individual and collective disadvantages at the same time; it has a high pollution level, traffic jams, almost no urban services or social interaction. Second, the "Raider city", allows only individual advantages, which a reduced amount of people can access, while it causes damages to the collectively; for example, the use of motorized vehicles in a highway may cause high emissions of CO_2 to the city. Third, the "Pioneer city", where the citizen accepts an individual disadvantage to achieve a collective advantage; there are some examples about mobility where people, instead of using private cars, they have to use public transport, changing policies and creating new pedestrian areas. Finally, the smart city, can be understood as the evolution of the latest city, it has individual advantages and at the same time, collective advantages.

Nevertheless, for Dall' Ò (2014) the classification is a tool to understand the characteristics that prevail and some methodologies for the evaluation of the smartness of the city must not be only on quantitative terms but qualitative. Thus, the city that becomes smart is the one that is able to improve in parallel all the different areas that contribute to solving the issues related to the economic, social and environmental aspects of the city.

2.6

SMARTNESS FOR SUSTAINA-BILITY

The high speed of urbanization constitutes the most imposing mode of change of the landscape, done by the human but at least 80% of the world's Gross Domestic Product - GDP is generated in cities and nowadays, their perspective of development includes an economy based on the production of knowledge and on the capability of cities to attract new talents such as professionals and skilled persons[10]. More competitive cities are characterized by the increase in population, employment, goods and services but also the capacity of attracting different and specific functions, of high educational, financial, political and cultural (Costantino, 2015). While urban areas are the core or national social-economical system, they concentrate universities and centres for research and innovation, political activism and cultural exchange; the features and potentialities can help to define an urban agenda for the sustainable future through the valorisation of human resources and skills, attract human capital and international financial, economic and culture flow. Thus, urban sustainability must be understood as a complex and gradual process of change, in the management of the environment, social economic and technological resources with institutional changes; and smart city is a chance to achieve sustainability in

the sense that is based on the investment in the same elements; the social capital, use of technology and the efficient use of resources and improving the quality of life of citizens.

Nevertheless, the concept of the smart city lacks a unanimously accepted definition[11], it can be adopted in different places, but the transfer of the concept must be analysed and adapted to the context; according to the level of development of the city, being aware of the resources and objectives
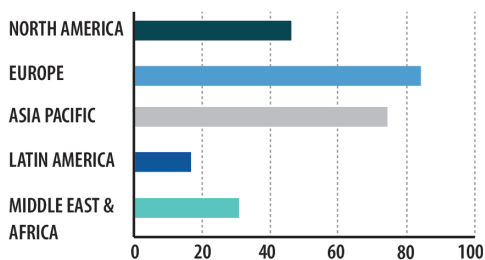
Figure 20. Number of Smart city projects worldwide.

of the (Chatterjee & Kar, 2015), while creating an integrated vision for the city and considering the collective intelligence. The project is shaped by the leadership of the government while it involves different stakeholders and considering the interest of investors and the participation of the citizens, adding complexity and becoming a long-term process that led benefits for the city.

Smart initiatives are spread around the globe, in both developed and developing regions, based on the advantages that the correct use of technology can bring to city encouraging innovation and a more participative society (Angelidou, 2015); differences can be perceived according to the level of maturity of the smart cities (Waarts, 2016). It is important to consider two factors that stimulate this trend, the supply and demand side, in the smart city economy. First, the supply side is related to the ICT companies and the speed of technological advances, that impact on the market with "smart" products and solutions. Second, the demand side is related to cities that aims to tackle sustainability problems that require of innovative and effective solutions.

As general panorama and in quantitative terms (Estevez et al., 2016), smart cities by region are in Europe 37%, Asia Pacific 28%, Africa 13%, North America 13%, and Latin America and Caribbean 9%. Also, smart initiatives focus on the dimensions of smart living, smart environment and smart economy; most of them are implemented and planned by the governments into a top-down policy approach. In the same perspective, the sectors of the industry in which new projects have been developed include the investment on open data platforms, smart grids, networked street lights, urban mobility, energy-efficient buildings, water management, and government service applications (Navigant Consulting, 2017).

However, literature doesn't clearly establish a differentiation between smart cities in developed countries and developing countries. In the next section, the target, problems and solutions that must be considered when transferring the concept to a specific place will be explained. It is clear that for the implementation of the smart city the infrastructure and ICT technology must be present, otherwise, how can the interconnectedness work?

$ MILLIONS

% POPULATION IN URBAN AREAS

SMART UTILITIES
SMART GOVERNMENT
SMART MOBILITY
SMART BUILDING

Figure 21. Smart cities market projection.

NORTH AMERICA
EUROPE
ASIA PACIFIC
LATIN AMERICA
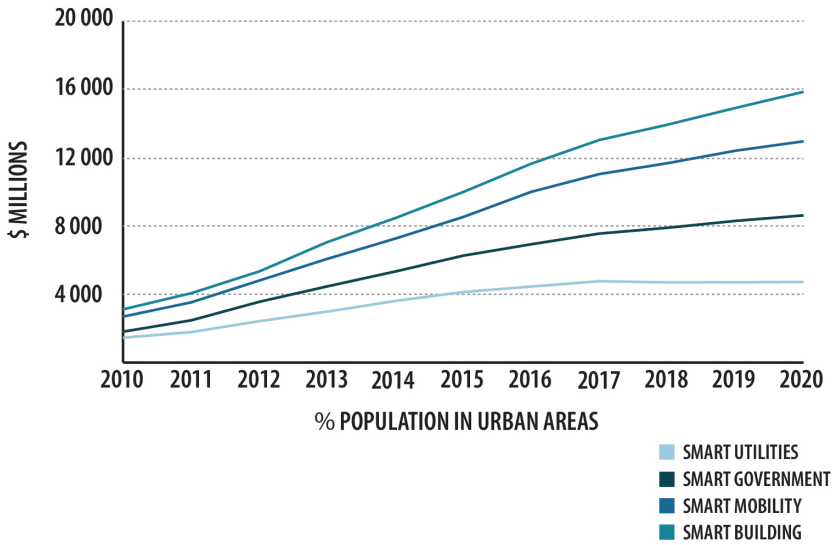MIDDLE EAST & AFRICA

SMART GOVERNMENT
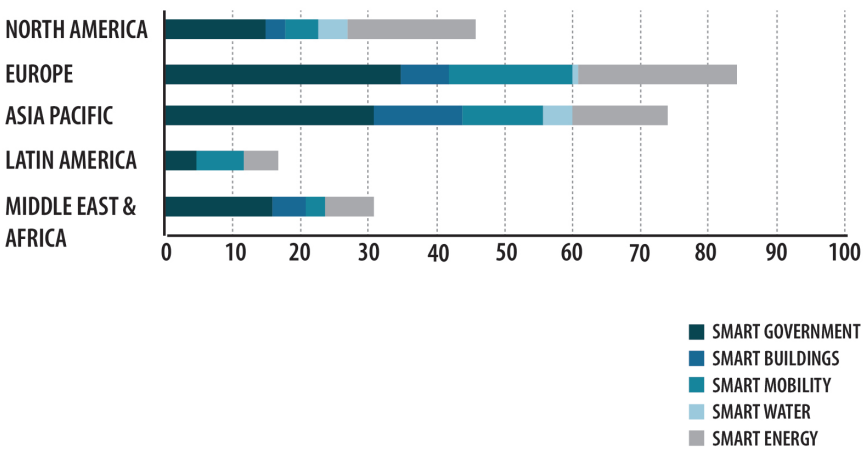SMART BUILDINGS
SMART MOBILITY
SMART WATER
SMART ENERGY

Figure 22. Investment on smart solutions by region.

PART 02

THE SMART CITY IN DEVELOPING COUNTRIES

3. SUSTAINABILITY FOR DEVELOPING COUNTRIES

As the smart city arises as a response to the urban challenges, the thesis aims to demonstrate that it is a city model for urban sustainability for the developing south, that seems to be more vulnerable to the effects of environmental change; but due to the structural differences with the developed countries, the concept cannot be applied as the same, it must be reimagined and adapted to a specific context. This thesis will try to answer the following main research question:

- Is the smart city a model of urban sustainability in developing countries? Especially in Latin America and the Caribbean?

In order to guide the research process, it is important to outline, map and discuss the smart city model in developing countries doing a distinction with indifferent context-based smartness; also, a set of additional sub-questions has been elaborated, to provide enough knowledge to answer the central question.

- How is urban sustainability achieved through the smart city model?
- What is the approach of the smart city model in developing countries?
- Which are the goals of urban management?
- Which are the urban innovations in Latin America and the Caribbean cities?
- Is there a specific smart solution for developing countries?

Although the term Latin America and the Caribbean[12] can be ambiguous and arguably, it is used to refer some countries from North, Central and South America, that share religion, culture and language. For some global institutions the number of countries that compose the region can vary, but the present work it will consider a list of 26 countries that both The United Nations and The World Bank consider in their data and rankings: Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Perú, Suriname, Trinidad y Tobago, Uruguay, Venezuela. Also, some cities from Puerto Rico[13] and The Bahamas[14] are included in tables and maps.

The relevant bibliography includes academic publications: books, journals and thesis; news on web and articles; while the statistical data, used for the maps and elaboration of the matrix for comparison, comes from reports and information from relevant globally recognized institutions such as the United Nations, the World Bank, and regional based institutions as the Interamerican Development Bank, the European Union, etc.

The present work presents a combined quantitative and qualitative methodology, as the mapping of urban innovation in diverse territorial contexts can help to understand the process of mobility of the urban policies in a transnational framework (Ponzini & Manfredini, 2017). To explain the target and problems of the cities towards the smart implementation there is a general listing of the existing smart cities and projects worldwide, considering the sector of smartness in around 186 cities, based on the information from different reports as "The road towards the smart city" from the Interamerican Development Bank, "Sustainable Smart cities" from the United Nations University, some publications of specific cities studies led by IBM as consulting of local governments in the implementation of smart solutions; and other sources from rankings: Green Index ranking, IESE Cities in Motion index ranking, Intelligent Community Smart21 ranking, Fast Company ranking of smart cities. As an output, the differences in the context and their characteristics are further investigated to have a panorama of the goals in urban management through the analysis of the space and the innovations are explained according to the three dimensions of the sustainability as the environment, society and economy and that is represented by a first spatial database; so an important indicator is the urbanization rate to visualize the impact of the cities on the built environment that linked the economy and income level, as well as the social factor, like the access to urban services and the democracy rate. In that sense, Latin America and the Caribbean is the most urbanized region in the world that deals with social demand for services that trigger new conception of urban agenda towards urban sustainability.

With that first analysis, the second phase of mapping is related to understand the type of smart dimension that cities are focusing, and later on, there is a focus in the innovation that is context based.

Finally, considering the different and specific innovations made us question the internal city synergies of collective intelligence that generate valuable innovations, and consequently the case of Lima city is explained as it has different informal networks of intelligence.

3.1

SUSTAINABILITY CHALLENG-ES

Information and communication technology or ICT is considered as the highway system of the century; in developing regions it brings the idea of necessarily being connected to be competitive in the global economy; but how to become smart if the infrastructure in the city is incomplete, if it is difficult to maintain and the priorities of investment are different than bringing competitiveness in areas where access to housing is a daily challenge?

Some of the sustainability challenges in the developing south are the fast population growth and their collateral effects as the limited access to urban services, the lack of infrastructure and the limited building capacity. While the change in the population and structure of the cities is explained due to the migration of population from the rural cities to metropolitan areas, not all the people have the capacity to maintain in the city centre, and informal settling or slums emerge as a common characteristic and self-response of the community.

According to Vincent N. Kitio, chief of Urban Energy Unit of the UN-Habitat[15]; the smart city is articulated by the use of technology and communications to provide access to urban basic services, unfortunately, that is not happening in developing countries as in Africa or in India, where the access to population to sanitation services is less than the access to a mobile phone; even if the device so the technology can be used for more other things.

The implementation of the smart city opens a wide range of opportunities to improve some urban conditions, but still there is a debate about the advantages and differences of being inside – outside the technological revolution; and some contrasting features can be found in the implementation of smart cities in developing countries, as the controversial project of 100 smart cities in India[16] which projects the transformation of existing cities and the construction of sketch; but it does imply the change of land use, the creation of normative and in some cases the exchange of civil rights for security[17]. For the development of "Dholera Metro City" the relocation and acquisition of land from small communities which has been dedicated only to agriculture was necessary but the big question from part of the people was that money exchange was not enough for those they weren't prepared to live in a city, complaining about jobs, education and basically integration in the society.

3.2
DIFFERENT GOALS IN URBAN MANAGEMENT

Developing countries present diversity and structural differences in comparison with developed countries, as it is possible to explain different goals in urban management according to smartness.

The economy, in most of the cases, is based on the exploitation of primary resources and is characterised by lack of resources for investment, budget constraints and clear segregation of population, so the aim is to create and use management systems for an efficient use and monitoring of the resources available but with implications in the redistribution of social benefits through the investment on the social capital, improval of the education system, and the pursuit of investment and promotion of small business and start-ups for the generation of employment. Those can be achieved through the adoption of policies that foster the investment of infrastructure and focus on the smart dimensions such as the smart economy: the infusion of capital of productive agglomeration and the formalization of business; smart government: the digitalization of information to reduce the waste and regain transparency in the use of resources; smart mobility: in order to facilitate the mobility of the production chain; smart people: the investment on the knowledge production.

The society is complex and reflects many contradictions, privations of citizen rights and segregation of population, so in order to achieve stability and cultural diversity towards equity and inclusion, through the access to housing in terms of quantity and quality, enabling spaces for social inclusion for the indigenous population, access to proper infrastructure for health, thus offering different services to protect vulnerable populations, the monitoring and reduction of criminality and the digital inclusion that means access to the ICT technologies and the development of skills. As a response smart mobility is linked to the social (Jeekel, 2017) in the way it can ensure the accessibility to the city infrastructure, in terms of time and distance; the smart living related to the development of strategies that can ensure the access to housing, slum upgrade, also the investment on training of people, the knowing of their civil rights and the access to digital technologies to ensure the citizen participation, the implementation of urban laboratories and centres for the sharing of knowledge to foster innovation.

Thus, the environmental dimension is characterized by the presence of natural resources, the urban pressure which impacts on the space and its limited capacity to support life. Therefore, the priorities are the promotion of planning tools and the sustainable urban development, controlling the

expansion of the city and managing the access to drinking water, electricity and the management of drain system and waste, which are basic services that are unequally distributed in the city and the provision of public space as social interaction and justice. Also, the monitor and prevention of eventual natural disasters and other catastrophises. Consequently, the smart solutions related to the topic are the smart living but with a focus on the social inclusion and the right to the city, the implementation of strategies towards the increase and access to public space, green areas and the exposure of people to the nature in order to improve the environmental behaviour and take consciousness of their actions; the management of waste, recycling and business related.

In the same perspective, when implementing initiatives towards the smart city, it is important to consider that the target, problem and solutions are different and must be context based. In some cases, the use of technology can be simpler based but having a big impact, so the characteristics and indicators in the dimensions of smartness are different.

ECONOMY

MANAGEMENT SYSTEMS TO USE THE
RESOURCES AVAILABLE

PEOPLE

STABILTIY AND CULTURAL DIVERSITY
TOWARDS EQUITY AND INCLUSION

ENVIRONMENT

IMPACT ON THE SPACE AND ITS LIMITED
CAPACITY TO SUPPORT LIFE

Figure 23. Diferences in urbana management goals.

DEVELOPED COUNTRIES

DEVELOPING COUNTRIES

- CONSOLIDATION OF TECHNOLOGICAL HUBS
- INCREASE THE LEVEL OF COMPETITIVENESS

- GENERATION OF EMPLOYMENT TO REDUCE POVERTY
- INCREASE LEVEL OF COMPETITIVENESS
- DIGITALIZATION OF DATA TO IMPROVE MANAGEMENT AND USE OF RESOURCES
- IMPROVE EDUCATION FOR PEOPLE
- FOSTER INVESTMENT AND START UP PROMOTION

SMART GOVERNANCE — DATA SHARING

SMART ECONOMY — CONSOLITTION OF PRODUCTIVE CLUSTERS

- NEW SERVICES TO IMPROVE SOCIAL INTEGRATION
- USE OF ICT TO REDUCE CRIMINALITY
- USE OF TECHNOLOGY TO IMPROVE HEALTH

- REDUCE SOCIAL INEQUALITIES
- ENSURE ACCESSS TO HOUSING
- ENSURE ACCESS TO HEALTH /SANITATION
- DIGITAL INCLUSION
- REDUCTION OF CRIMINALITY
- PROTECT VULNERABLE POPULATIONS

SMART MOBILITY — ACCESS TO CITY INFRASTRUCTURE

SMART PEOPLE — ACCESS TO EDUCATION TO FOSTER INNOVATION

- MITIGATION AND ADAPTATION TO CLIMATE CHANGE
- REDUCTION OF C02 AND GAS EMISSIONS
- NEW ALTERNATIVE ENERGY GENERATION
- USE OF TECHNOLOGY TO IMPROVE MOBILITY
- PROMOTION OF ALTERNATIVE MOBILITY

- SUSTAINABLE URBAN DEVELOPMENT
- REDUCE IMPACT NATURAL DISASTERS
- ACCESS TO DRINKING WATER AND CLEAN SOURCES OF ENERGY
- WASTE MANAGEMENT
- PROVISION OF PUBLIC SPACE

SMART ENVIRONMENT — PREVENTION AND MONITORING OF NATURAL DISASTERS

SMART LIVING — THE RIGHT TO THE CITY

DIMENSION	COMPONENTS	INDICATORS
SMART ECONOMY	E-BUSINESS AND E-COMMERCCE LOCAL & GLOBAL NETWORKS	PUBLIC EXPENDITURE ON R&D PUBLIC EXPENDITURE ON EDUCATION GDP PER HEAD OF CITY POPULATION UNEMPLOYMENT RATE
SMART ENVIRONMENT	SMART BUILDINGS ENVIRONMENTAL MANAGEMENT URBAN PLANNING	AMBITIOUSNESS OF CO2 EMISSION REDUCTION STRATEGY EFFICIENT USE OF ELECTRICITY, EFFICIENT USE OF WATER GREENHOUSE GAS EMISSION INTENSITY OF ENERGY CONSUMPTION POLICIES TO CONTAIN URBAN SPRAWL PROPORTION OF RECYCLED WASTE
SMART MOBILITY	MIXED-MODAL ACCESS CLEAN & NON-MOTORIZED	TIME SPENT FOR TRAVEL REDUCTION OF CO2 EMISSION COMMUNITNG EFFICIENCY
SMART LIVING	QUALITY HEALTH SERVICES SAFETY AND MONITOR SYSTEMS CULTURE AND HAPPINESS GOOD QUALITY HOUSING	PROPORTION OF AREA FOR SPORTS AND LEISURE USE NUMBER OF PUBLIC LIBRARIES TOTAL BOOK LOANS AND OTHER MEDIA MUSEUM VISITS, THEATER AND CINEMA ATTENDANCE
SMART PEOPLE	INNOVATION IN EDUCATION INCLUSIVE SOCIETY CREATIVITY	PERCENTAGE OF POPULATION WITH SECONDARY-LEVEL EDUCATION FOREIGN LANGUAGE SKILLS PARTICIPATION IN LIFE-LONG LEARNING INDIVIDUAL LEVEL OF COMPUTER SKILLS PATENT APPLICATIONS PER INHABITANT
SMART GOVERNMENT	INTERCONNECTED WITHIN CITY AND ACROSS CITY AND INTEGRATE PUBLIC, PRIVATE, CIVIL ORGANIZATIONS.	NUMBER OF UNIVERSITIES AND RESEARCH CENTERS IN THE CITY E-GOVERNMENT ON-LINE AVAILABILITY E-GOVERNMENT USE BY INDIVIDUALS

DIMENSION	COMPONENTS	INDICATORS
SMART ECONOMY	OPPORTUNITY PRODUCTIVITY LOCAL & GLOBAL NETWORKS	GDP PER CITY POPULATION EMPLOYMENT RATE GINI COEFFICIENT
SMART ENVIRONMENT	ENVIRONMENTAL MANAGEMENT URBAN PLANNING REDUCCION OF POLLUTION	URBANIZATION RATE POLICIES TO CONTAIN URBAN SPRAWL CO2 EMISSION REDUCTION EFFICIENT USE OF ELECTRICITY AND WATER AREA IN GREEN SPACE PROPORTION OF RECYCLED WASTE
SMART MOBILITY	MOBILITY SERVICE ACCESSIBILITY MIXED-MODAL ACCESS USE OF CLEAN ENERGY AND RENEWAL OF TRANSPORT SYSTEM	KM OF TRANSPORT NETWORKS NUMBER OF PASSANGERS USING THE SERVICE TIME / KM NUMBER OF INCIDENCES IN THE SERVICE
SMART LIVING	ACCESS TO HOUSING STABLE ELECTRICITY AND WATER PROVISION IMPROVE OF SAFETY ACCESS TO PUBLIC SPACE CULTURAL FACILITIES	NUMBER OF PEOPLE LIVING IN SLUMS PEOPLE WITH ACCESS TO LIGHTING, WATER NUMBER OF SECURITY INCIDENCES NUMBER OF PUBLIC FACILITIES
SMART PEOPLE	EDUCATION INCLUSIVE SOCIETY CREATIVITY	PERCENTAGE OF POPULATION WITH EDUCATION LEVEL IMPROVEMENT IN READING AND MATHEMATICS LEVEL ACCESS TO ICT TECHNOLOGIES AND INTERNET IN SCHOOLS NUMBER OF SCIENTIFIC RESEARCH AND PRODUCTION
SMART GOVERNMENT	ONLINE SERVICES INFRASTRUCTURE OPEN GOVERNMENT	NUMBER OF UNIVERSITIES AND RESEARCH CENTERS IN THE CITY OPEN DATA AVAILABLE PERCENTAGE OF HOUSEHOLDS WITH INTERNET ACCESS AT HOME

Table 1. Indicators of smartness in developed (up) and developing countries (down).

3.3

LATIN AMERICA AND THE CARIBBEAN

Although Latin America and the Caribbean is the most urbanized region in the world, most of the cities lack basic infrastructure and basic public and social services (Angotti & Irazabal, 2016) that are fundamental to ensure the quality of life, to allow the creation of employment and address environmental challenges. But the characteristics of the urban growth in Latin America and the Caribbean have changed over time without distinction of the scale of the city; the big metropolises still continue to have an important role for the country, but they are not the only one experimenting highest growth rates; the medium-sized cities are leading the regional urban population growth. The new patterns of urbanization represent new challenges for the local and national governments. Moreover, intermediate cities are characterized by high poverty rates forcing the government to strenghen their institutional capacity and create new solutions to deal with the scarcity of resources (Villavicencio Beltran, 2011).

As the urbanization process will continue, thus sustainable development challenges will increase, in time and space, and phenomena will be concentrated in low-middle income countries (United Nations, Department of Economic and Social Affairs, 2014); Latin America and the Caribbean is the most urbanized region in the developing south and concentrates an important number of initiatives of smart cities based on the optimization of the use of resources, mobility, broadband expansion and monitoring centre for security and risk events. According to the Data Booklet, around 12.70% of the regional population is located in megacities that have more than 10 million inhabitants[18] (United Nations, 2016): Sao Paolo in Brazil, Ciudad de Mexico in Mexico, Buenos Aires in Argentina, Rio de Janeiro in Brazil and Lima in Perú; thus, Bogotá in Colombia will be added to the list in a population projection for 2030.

Some collateral effects of the economic globalization and neoliberal policies have impacted on the movement of people to different cities which causes, in most cases, unplanned changes in the urban form, economic and social structures of the cities. Furthermore, it creates many contradictions (Bolívar, Rodríguez Mancilla, & Erazo Espinoza, 2015) in the social dimension, especially related to housing provision and distribution of urban services and investment that triggers other problems; citizens without cities vs. cities without citizens, because the restriction to some areas due to the privatization of the space and the installation of security bars define illegal boundaries that cause urban

segregation of rich neighbourhoods. On the other hand, some areas of the city are struggling with limited access to urban services as water, electricity, security, public space and culture so people are not fully citizens. Another contradiction is the competitive cities and global hubs vs. marginal and vulnerable housing settlements; the investment in some areas of the city can bring global connection but it is important to invest also in conflictive areas of the city, where urban density, accessibility, and other problems don't allow the integration of the entire metropolis. Still, the region has experienced a notable transition towards democratic consolidation in the last three decades, and that is a key in order to ensure the development of the cities and promote social inclusion (Bonometti & Ruiz Seisdedos, 2010).

As the implementation of the smart city model requires implementation capacity and collaboration between public and private organizations, the investment of those urban initiatives is reflected in the spatial location. Most of the smart cities are located in countries with upper-middle income, while two countries with high income, Chile and Uruguay, have different strategies to achieve the smart city. In the case of Chile, it is one step ahead while developing Santiago Smart City, a business-oriented district with new technological laboratory and innovation hub. Cities like Barceloneta and Montevideo are focused on socio-economic technology development and export, the first one focused on pharmaceutical products while the second one on software and ICT technologies. Therefore, there is a productive circle of injection of capital, both for investors in the research and the improvement of city services, and the services that are able to attract creative people.

Latest Urban Dialogs (UN-Habitat, 2016) recalls three important aspects concerning the right to the city, policy-making and mobility challenges; that is directly connected with the goals of the sustainable development.
In the first aspect, the right to the city, is linked to both social and the constructed environment, cities should create spaces of opportunity and conditions for innovation ensuring social inclusion; following principles of sustainability, democracy[19], equity and social justice; therefore, sustainability is a guideline for land use planning at multiple scales: national, regional, metropolitan, urban, rural and neighbourhood.
The second aspect, policy-making is related to people, economy and the environment; according to that, cities should include the concept of the mega event as an urban policy that is able to trigger the development of the

cities; for example, Ecuador has also hosted The Network of Fair, Democratic and Sustainable Territories in 2014. Finally, the mobility challenges are interconnected with the environment and the quality of life of people and that impacts also the economy of the city; the improvement of mobility implies the use of specific policies to deal with specific problems, for example, the reduction of the speed limit in large avenues of the city centre in Sao Paulo in Brazil.

RANK	CITY	COUNTRY	POPULATION (THOUSANDS)
5	SAO PAULO	BRAZIL	21 297
7	CIUDAD DE MÉXICO	MEXICO	21 157
13	BUENOS AIRES	ARGENTINA	15 334
20	RIO DE JANEIRO	BRAZIL	12 981
31	LIMA	PERU	10 072

Table 2. Most populated megacities in 2016.
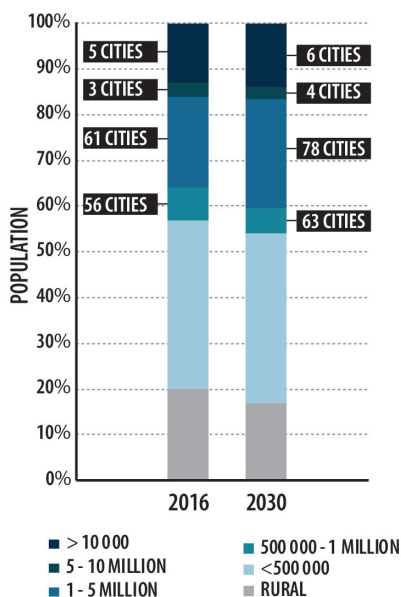
Figure 24. Concentration of urban population in Latin America and the Caribbean cities.

RANK	PREV	CITY	COUNTRY	POPULATION (THOUSANDS)
10	-3	CIUDAD DE MÉXICO	MEXICO	23 865
11	-5	SAO PAULO	BRAZIL	23 444
18	-5	BUENOS AIRES	ARGENTINA	16 956
23	-3	RIO DE JANEIRO	BRAZIL	14 174
30	+1	LIMA	PERU	12 221
31	+	BOGOTA	COLOMBIA	11 966

Table 3. Most populated megacities projection to 2030.

LEGEND

● SMART CITIES

URBAN POPULATION
- 0-25 %
- 25-50 %
- 50-75 %
- 75-100 %

CITY POPULATION
- 1 - 5 MILLION
- 5 - 10 MILLION
- 10+ MILLION

Map 1. Concentration of urban population in Latin America and the Caribbean cities.

CODE	CT. REF	COUNTRY	CITY REF	CITY	RANKING 2017	PERFORM ANCE	CIMI	CATEGORY	CPI
ARG	1	ARGENTINA	1	BUENOS AIRES	83	RA	62.32	Moderated solid	68.65
CHL	7	CHILE	1	SANTIAGO	85	RA	62.74		
MEX	19	MEXICO	1	MEXICO CITY	87	RA	62.22	Moderated solid	68.07
COL	8	COLOMBIA	2	MEDELLIN	96	M	59.91	Moderated solid	62.49
URY	26	URUGUAY	1	MONTEVIDEO	99	M	59.09		
BRA	6	BRAZIL	9	SÃO PAULO	101	M	58.94	Moderated weak	59.35
ARG	1	ARGENTINA	2	CÓRDOBA	107	M	56.70		
MEX	19	MEXICO	6	MONTERREY	111	M	55.74		
CRI	9	COSTA RICA	0	SAN JOSÉ	112	M	55.74		
COL	8	COLOMBIA	1	BOGOTÁ	113	M	55.30		
BRA	6	BRAZIL	2	RIO DE JANEIRO	114	M	54.84		
PER	23	PERÚ	1	LIMA	116	M	54.61	Moderated solid	67.82
BRA	6	BRAZIL	4	PORTO ALEGRE	119	M	54.15		
MEX	19	MEXICO	3	GUADALAJARA	121	M	52.85	Moderated solid	64.21
COL	8	COLOMBIA	3	CALI	122	M	52.19		
ECU	12	ECUADOR	1	QUITO	130	M	51.01	Moderated weak	55.50
BRA	6	BRAZIL	3	CURITIBA	131	M	50.76		
BRA	6	BRAZIL	10	SALVADOR	135	M	49.62		
BRA	6	BRAZIL	5	FORTALEZA	136	M	49.07	Moderated weak	50.96
ARG	1	ARGENTINA	3	ROSARIO	139	M	47.49		
BRA	6	BRAZIL	1	BRASILIA	143	M	47.18		
GTM	14	GUATEMALA	0	GUATEMALA CITY	149	M	46.44	Moderated weak	56.19
BRA	6	BRAZIL	6	RECIFE	151	M	45.40		
BRA	6	BRAZIL	11	BELLO HORIZONTE	153	B	44.98		
ECU	12	ECUADOR	2	GUAYAQUIL	160	B	43.08	Moderated solid	61.17
BOL	5	BOLIVIA	0	LA PAZ	170	B	39.25		
BOL	5	BOLIVIA	1	SANTA CRUZ DE LA SIERRA	172	B	38.11		
VEN	27	VENEZUELA, RB	0	CARACAS	173	B	38.03		
BHS	2	BAHAMAS, THE	1	NASSAU					
BRB	3	BARBADOS	0	BRIDGETOWN					
BLZ	4	BELIZE	0	BELMOPAN					
BRA	6	BRAZIL	7	NITEROI					
BRA	6	BRAZIL	8	ITU					
BRA	6	BRAZIL	12	PIRAI					
CHL	7	CHILE	2	ANTOFAGASTA					
CHL	7	CHILE	3	VALPARAISO					
CUB	10	CUBA	0	HAVANA					
DOM	11	DOMINICAN REPUBLIC	0	SANTO DOMINGO					
SLV	13	EL SALVADOR	0	SAN SALVADOR					
GUY	15	GUYANA	0	GEORGETOWN					
HTI	16	HAITÍ	0	PORT-AU-PRINCE					
HND	17	HONDURAS	0	TEGUCIGALPA					
JAM	18	JAMAICA	0	KINGSTON					
JAM	18	JAMAICA	1	MONTEGO BAY					
MEX	19	MEXICO	2	CHIHUAHUA					
MEX	19	MEXICO	4	TOLUCA					
MEX	19	MEXICO	5	ZAPOPAN					
MEX	19	MEXICO	7	CIUDAD OBREGÓN				Moderated solid	64.35
MEX	19	MEXICO	8	DURANGO					
MEX	19	MEXICO	9	TUXLA GUTIERREZ					
NIC	20	NICARAGUA	0	MANAGUA					
PAN	21	PANAMÁ	0	PANAMA CITY				Moderated solid	61.17
PRY	22	PARAGUAY	0	ASUNCIÓN					
PER	23	PERÚ	2	TRUJILLO					
PER	23	PERÚ	3	CUSCO					
SUR	24	SURINAM	0	PARAMARIBO					
TTO	25	TRINIDAD Y TOBAGO	0	PORT OF SPAIN					
PRI	*	PUERTO RICO	0	SAN JUAN					
PRI	*	PUERTO RICO	1	BARCELONETA					

■ IESE CITIES IN MOTION 2017
■ WORLD BANK CITY PROSPERITY INDEX 2017

Table 4. Indicators of sustainability of Latin America and the Caribbean cities.

3.4
REGIONAL RESPONSE

In the last decade, the region had hosted different major events related to culture and sustainability and cities are aiming efforts for a better quality of life to their citizens; the 2012 Rio 20 United Nations on Sustainable Development held in Rio de Janeiro, Brazil; the United Nations Climate Change Conference - COP 20 realised 2014 in Lima, Perú; the United Nations Conference Habitat III in 2016 developed in Quito, Ecuador. Furthermore, local authorities take into account the results of rankings as the IESE Cities in Motion Index – CIMI, (IESE, 2017), a reference tool for diagnosis and benchmarking of cities[20]; in the last year edition, the region had occupied some of the lowest positions between 100 cities, with exception of Buenos Aires in Argentina, Santiago in Chile, Mexico City in Mexico, Medellin in Colombia and Montevideo in Uruguay. This exposed the importance of making changes in the existing strategies and settling regional agreements and collaboration towards a sustainable development.

An important financing entity is the Development Bank of Latin America – CAF that has been promoting the creation of proposals regarding regional integration and engaging participation of both the public and private to address an integral vision of development in Latin America and Caribbean cities. Through the promotion of several programs, initiatives, events[21] and investigations, it takes into consideration the agreements done in the New Urban Agenda, the implementation of guidelines and the sharing of the approaches to promote and manage a proper urban development; translating from a contextual analysis to the development of feasible strategies to consolidate cities as drivers of growth and development in the region[22][23]. For example, the "Emerging and Sustainable Cities Program – ESC" is a technical assistance program that provides support to the different governments for planning and development of City Action Plans through the identification and hierarchization of urban issues[24] and the construction of collective platform "Urban Dashboard"[25][26]. As a result (Oficina de Evaluación y Supervisión - OVE, 2016), the program had an impact on 71 cities of 26-member countries of the CAF, Cuba is not part of the network, facilitating the access of cities to assistance and investment on infrastructure, enhancing the cooperation between national, bilateral and multilateral sources.

Another important investment source was made by the Global Environment Facility – GEF[27] established in 1992 Rio Earth Summit, through the Global Platform for Sustainable Cities - GPSC[28]. It had launched

the Sustainable Cities Integrated Approach Pilot Program – SC IAP[29] which offered a grant of $151 million for the co-finance of urban projects[30] related the translation of knowledge to investment, water management, pollution, conservation of biodiversity, waste & sanitation. There were 27 cities selected in 11 countries around the world for city-level projects in Asia (China, India, Malaysia, Vietnam), Africa (Senegal, Côte D'Ivoire, South Africa) and Latin America (Mexico, Perú, Brazil, Paraguay).

POLICY OBJECTIVES & PLANNING

SPATIAL DATA AND INDICATOR DIMENSIONS

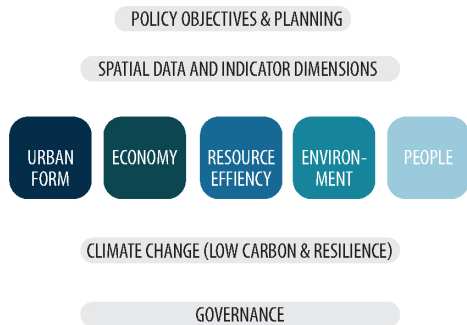| URBAN FORM | ECONOMY | RESOURCE EFFIENCY | ENVIRON- MENT | PEOPLE |

CLIMATE CHANGE (LOW CARBON & RESILIENCE)

GOVERNANCE

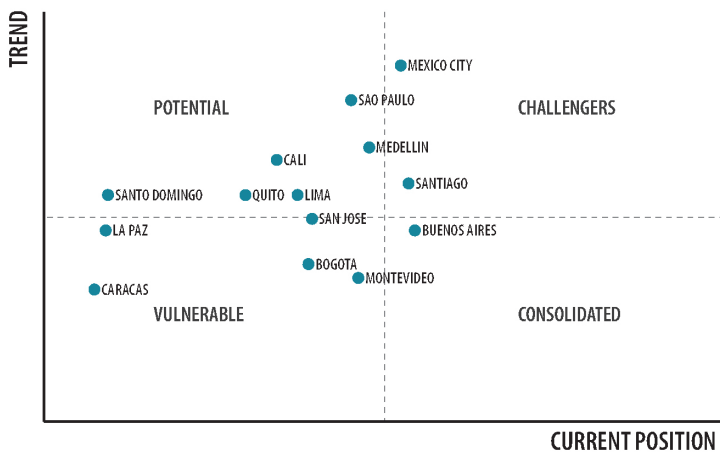**Figure 26. Pillars from the global platform for sustainable cities.**

Figure 25. IESE Cities in Motion Index in Latin America and the Caribbean.

4.SPECIFIC SMARTNESS FOR DEVELOPING COUNTRIES

Latin America and the Caribbean are progressively investing and exploring the concept of the smart city, motivated by the different initiatives and network promoted by government, technology business and the academia. Some ICT companies are focusing on the region as urban laboratory and productive market; according to recent studies[31]: "The Latin American smart city market is expected to grow 19.4% per year, reaching US$758bn in 2020, according to consultancy firm Markets & Market".

Likewise, different scales of government are aware of the advantages that the smart city model can bring in terms of management and efficient use of resources of the city; so, their activities are directed to the development of policies that allow the development, implementation, monitoring of the smart city model and the cooperation in the region so they can learn and share from different cities. Also, some worldwide events[32] aim to share the lasts products and innovations in the market and empower cities to start the transition to a sustainable, inclusive and efficient model. In the region, there was the 2013 Smart city expo Bogotá in Colombia, 2016 Smart city expo Puebla in México, 2017 Smart city expo Buenos Aires in Argentina in 2017, 2017 Smart city expo LATAM Congress Puebla in Mexico, 2018 Smart city expo in Curitiba

in Brazil.

Some of the principles that implementation of smart solutions in developing countries should be directed by the principles of coalescence, practicality and involvement (Chatterjee & Kar, 2015); as the smartness can help to achieve them urban targets in a viable, realistic project which offers real improvement to problems and requires that collaboration between all stakeholders at different levels, local, regional, national and even international participation.

Figure 27. Buenos Aires, Argentina.

4.1

THE INSURGENT INNOVATION

Global rankings that follow standards of the Northern rational/comprehensive planning do not considerate all the efforts of the cities in developing countries which are doing in order to overcome to urgent problems with the reconfiguration of the existing socio-spatial relationship and underestimate the innovative capacity or the region, just to mention the Smart21 ranking[33] promoted by media, it recognizes intelligent communities and mention only Brazilian, Mexican and Puerto Rican cities [34] (Angotti & Irazabal, 2016).

For Latin America and Caribbean cities, having to struggle with poverty and bearing the costs of future politics is difficult and costly if compared to wealthy people living in consolidated smart neighbourhoods, but people living in these dystopian slums and not even considered smart citizens, paradoxically have the ability to find incredible and creative ways for coping for scarce resources and developing urban lifestyles which are more environmentally sustainable and what began as a local innovation can become a global commodity (Vanolo, 2016). Nevertheless, a substantial change in the smart project is the emergence of new inter-organisational partnerships built around the development and implementation of data-driven governance projects, thus private sector benefits from the marketing campaign for these corporation's products and services and provide contributions to municipal governments and start-ups that can foster other initiatives. Although the flow of ideas and money through these organisational gatekeepers promoting smart ideas, a number of cities have themselves become key actors in mobilising particular policy interventions and exporting them to other localities and cities to compete for funding and fine-tune selected projects.
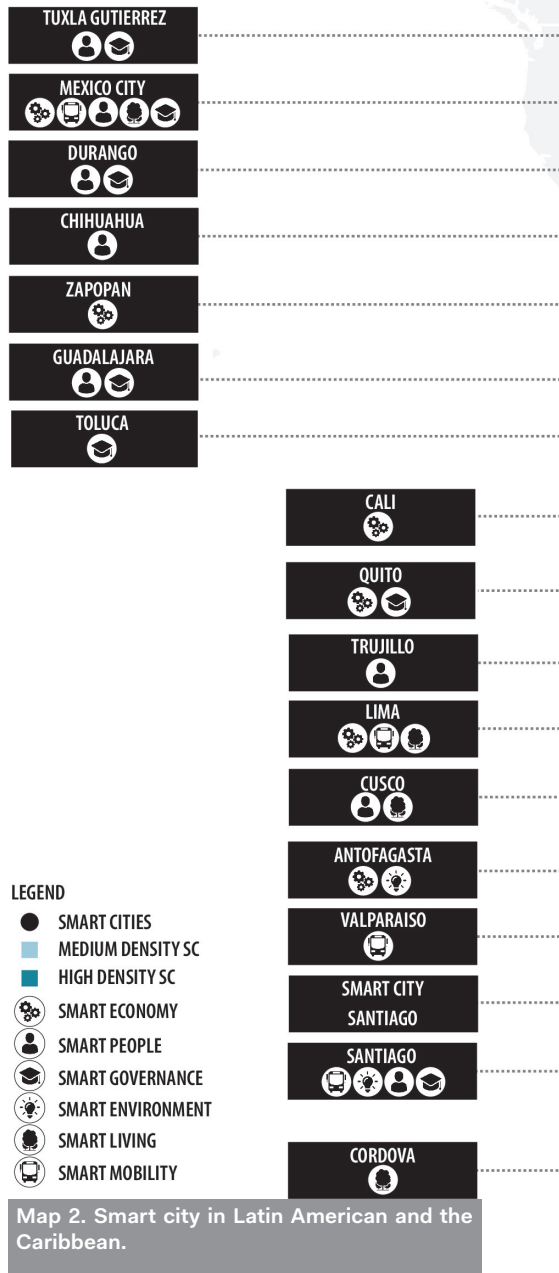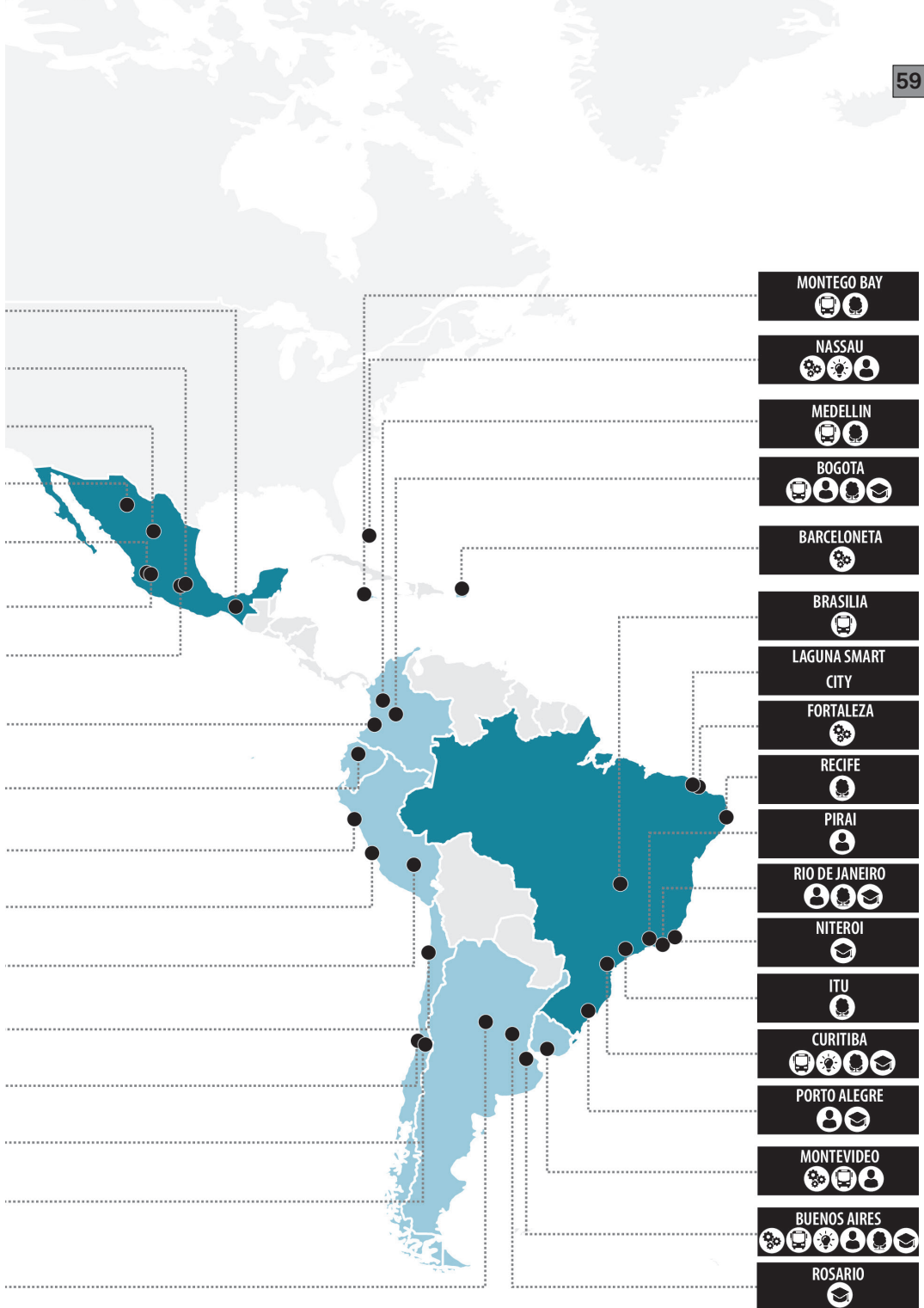

Figure 28. Mexico City, Mexico.

4.2

MAPPING SMARTNESS IN LATIN AMERICA AND THE CARIBBEAN

In a general image, initiatives in Latin America and the Caribbean are concentrated in countries with high-income level, in fact most of the urban innovations are located in the country capitals, due to the locational advantages, the demand of the market, the presence of larger infrastructure and the concentration of investment in different sectors of the national economy, thus promoting the productivity and connectivity both locally and globally scales (Cohen & Obediente, 2014). Such accumulation of capital is a factor that accelerates the displacement of people to bigger metropolitan areas (Angotti & Irazabal, 2016), and implies that the city can become socially, culturally and spatially polarized if is not invested in the local communities and social learning; in that line, actors should be aware of and participate in training programmes related to ICT technologies and development of new services, as part of an integrated strategy for the city improvement and not only to subsidize the requirements of the private sector (Hollands, 2008).

There is a common strategy to transform cities into smart cities in the developing south, unlike other international contexts where new cities are projected (Metropolitan Institute of Planification, 2015); it is a gradualist one since it starts with specific small projects, from

TUXLA GUTIERREZ

MEXICO CITY

DURANGO

CHIHUAHUA

ZAPOPAN

GUADALAJARA

TOLUCA

CALI

QUITO

TRUJILLO

LIMA

CUSCO

ANTOFAGASTA

VALPARAISO

SMART CITY
SANTIAGO

SANTIAGO

CORDOVA

LEGEND
● SMART CITIES
■ MEDIUM DENSITY SC
■ HIGH DENSITY SC
SMART ECONOMY
SMART PEOPLE
SMART GOVERNANCE
SMART ENVIRONMENT
SMART LIVING
SMART MOBILITY

Map 2. Smart city in Latin American and the Caribbean.

MONTEGO BAY

NASSAU

MEDELLIN

BOGOTA

BARCELONETA

BRASILIA

LAGUNA SMART CITY

FORTALEZA

RECIFE

PIRAI

RIO DE JANEIRO

NITEROI

ITU

CURITIBA

PORTO ALEGRE

MONTEVIDEO
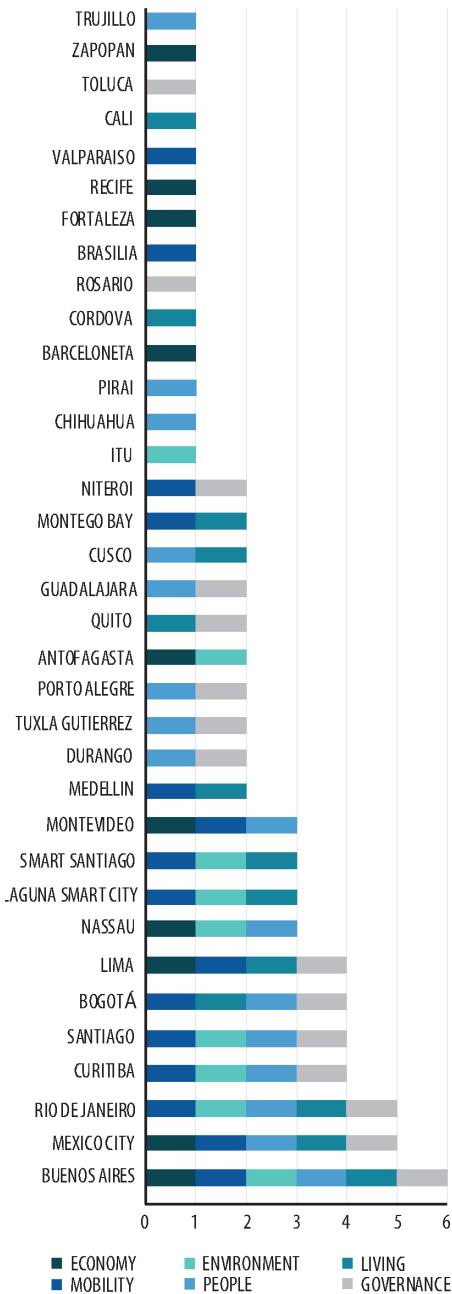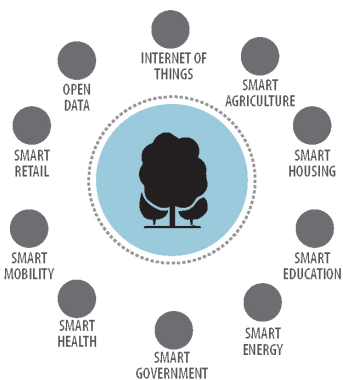
BUENOS AIRES

ROSARIO

Figure 29. Smart city in Latin American and the Caribbean.

the placement of security cameras in key areas to solutions of more complex systems at larger territorial scale in the use of infrastructure, water, electricity and mobility.

The map of urban initiatives is organised according to the location of the city and the smart dimension adopted and there is a list with the cities and the number of dimensions; hence, the description of projects is in the table in the appendix. Consequently, it is possible to identify two trends in adaptation of the smart city in Latin America and the Caribbean: context indifferent smart initiatives such as the simply import of available technologies and the context-based smart initiatives, which are product of the understanding of the social, economic and spatial territory; the potentialities of the place and taking into account the collective intelligence that is able to generate simple low tech solutions to tackle big urban problems. Bellow the six dimensions of the smart city are presented in the regional context as they present a different smartness approach and that cannot be the same that developed countries.

Figure 30. Smart living in Latin America and the Caribbean (right).

COMPONENTS OF SMART LIVING

- OPEN DATA
- INTERNET OF THINGS
- SMART AGRICULTURE
- SMART RETAIL
- SMART HOUSING
- SMART MOBILITY
- SMART EDUCATION
- SMART HEALTH
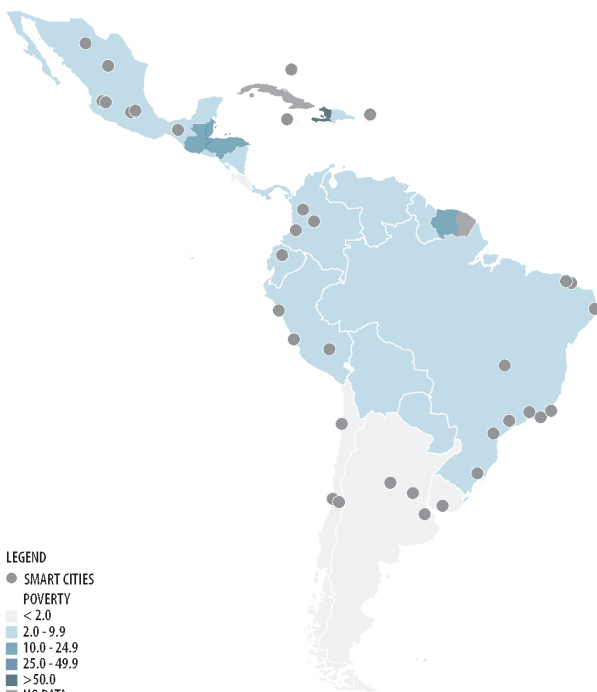- SMART ENERGY
- SMART GOVERNMENT

SMART HOUSING

SLUM DEPRIVATIONS

- DURABLE HOUSING (CLIMATE CONDITIONS)
- SUFFICIENT LIVING SPACE
- ACCESS TO SAFE WATER (AMOUNT AND PRICE)
- ACCESS TO ADEQUATE SANITATION
- SECURITY OF TENURE

LEGEND

- ● SMART CITIES

POVERTY
- < 2.0
- 2.0 - 9.9
- 10.0 - 24.9
- 25.0 - 49.9
- > 50.0
- NO DATA

- 2015
- 2005

Countries: ARGENTINA, BAHAMAS, BARBADOS, BELIZE, BOLIVIA, BRAZIL, CHILE, COLOMBIA, COSTA RICA, CUBA, DOMINICAN REPUBLIC, ECUADOR, EL SALVADOR, GUATEMALA, GUYANA, HAITI, HONDURAS, JAMAICA, MEXICO, NICARAGUA, PANAMA, PARAGUAY, PERÚ, PUERTO RICO, SURINAM, TRINIDAD AND TOBAGO, URUGUAY, VENEZUELA
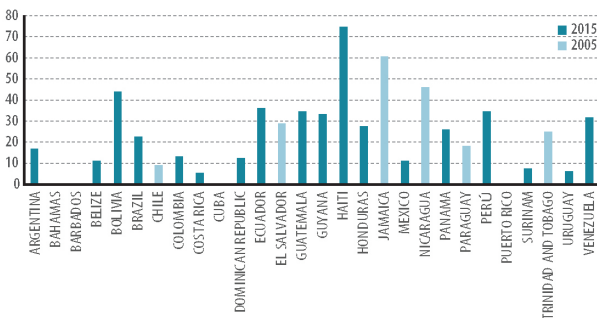
URBAN POPULATION LIVING IN SLUMS

FAVELA IN BRAZIL

BARRIOS BAJOS IN COLOMBIA

GUATEMALA

ASENTAMIENTO HUMANO IN PERU

SMART LIVING

Urban densification represents a phenomenon that has been present since the late 80's in Latin America and the Caribbean due to different social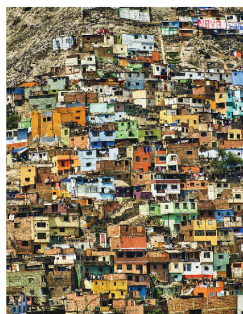 and economic factors as the concentration of opportunities, services, jobs in the main cities. It caused pressure on the provision and cost of both urban land and housing (UN-Habitat, 2011) thus growing inequalities as the access and affordability to housing became a critical issue and big part of the population does not have access to proper urban infrastructures such as electricity, water, transportation networks and urban services like education, health, culture that are basic to assure a minimum quality of life (UN-HABITAT, 2016). Thus, informal settlement and self-housing systems represented the solution for the urban poor which carries a quick solution to the lack of finance and the high cost, but it carries critical deprivations. Nowadays, slums persist in the region despite policy efforts (Inter-American Development Bank, 2016) and its population represents 30.80% of the total population (UN-Habitat, 2011).
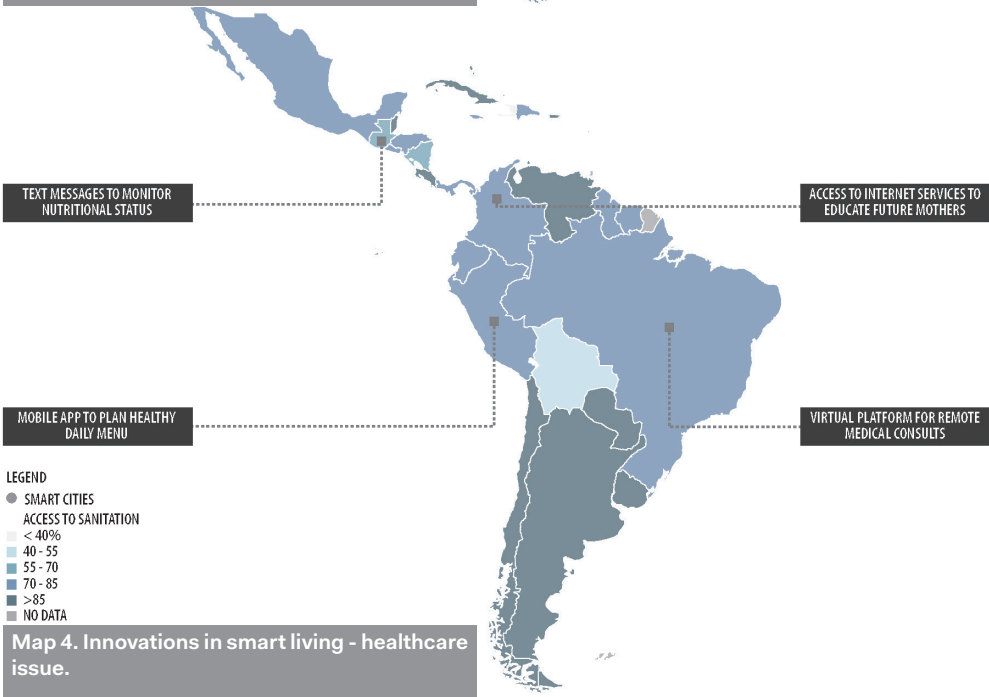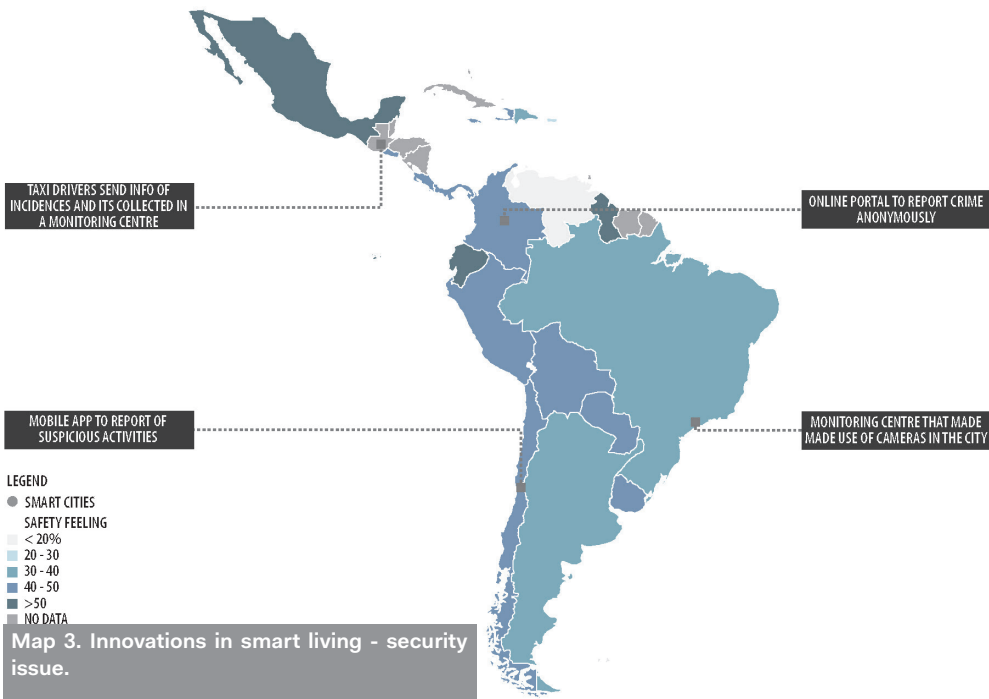
In that sense smart living represent a totally different challenge for developing countries, instead of monitoring and feedback from sensor networks everywhere, is important to rethink the smartness in these delicate areas of the city through a collaboration between government, industry, academy and the community enabling communication channels, reinforcing the local identity and generating shared benefits.

Some projects involve **mapping initiatives and participatory processes** to manage events in the environment[35] digitalizing information, street and others through a digital platform for empowerment for monitor and report government initiatives[36] what represents tools for the city planning and to have a better share of resources.

Participative mapping "Caminos de Villa" can be found in Buenos Aires, Argentina[37] where instead of grey areas, slums are mapped so citizens can report the state of the slum; while in Xalapa Mexico "Mapatón project" integrates public policies participation in order to improve public services, reducing the environmental impact and increasing efficiency on time.

Although improvement of **citizen security** is a priority because according to Citizen Council for Public Security and Penal Justice, 42 of the 50 most violent cities in the world are located in Latin America and the Caribbean; therefore, to raise the security levels, the coordination of various agencies of the city is crucial, such as also to monitor and act in public areas while respecting the rights of

TAXI DRIVERS SEND INFO OF INCIDENCES AND ITS COLLECTED IN A MONITORING CENTRE

ONLINE PORTAL TO REPORT CRIME ANONYMOUSLY

MOBILE APP TO REPORT OF SUSPICIOUS ACTIVITIES

MONITORING CENTRE THAT MADE MADE USE OF CAMERAS IN THE CITY

LEGEND
- SMART CITIES
  SAFETY FEELING
  - < 20%
  - 20 - 30
  - 30 - 40
  - 40 - 50
  - >50
  - NO DATA

Map 3. Innovations in smart living - security issue.

TEXT MESSAGES TO MONITOR NUTRITIONAL STATUS

ACCESS TO INTERNET SERVICES TO EDUCATE FUTURE MOTHERS

MOBILE APP TO PLAN HEALTHY DAILY MENU

VIRTUAL PLATFORM FOR REMOTE MEDICAL CONSULTS

LEGEND
- SMART CITIES
  ACCESS TO SANITATION
  - < 40%
  - 40 - 55
  - 55 - 70
  - 70 - 85
  - >85
  - NO DATA

Map 4. Innovations in smart living - healthcare issue.

citizens and developing new strategies so they can also collaborate with the system. Some results begin with creative systems that by using technologies and citizen watchmen create networks of information about security issues, the installation of cameras and in some more prosperous economies, the use of software for facial recognition up to the establishment of monitoring centres that work 24 hours a day and enables collaboration between the different security forces as the case of Rio de Janeiro Operations Centre – COR Rio, for example. In Vitacura in Santiago, Chile, the "SoSafe project"[38] enables local residents to report suspicious activity with a mobile app; in Medellín in Colombia people can report crime anonymously in an online portal; in Tuxtla Gutiérrez, Mexico there is the program "Vigilante Taxi Driver"[39] , an organized network of taxi drivers that report some incidents related to crime and infrastructure conditions, with the phone. Afterwards this information is collected into a web platform[40]. In Medellin, the web platform "ADenunciar"[41] allows the report of a crime saving time and protecting the data of users.

The low levels of **healthcare service** brought some initiatives to improve the accessibility of the service to poor areas, promote campaigns for the education and changing of behaviour up to the mapping of hotspots areas that could become infectious foci of viruses and other diseases. In Colombia, the "Buen Comienzo project", allows low-income future mothers to access the internet and giving information about medical issues, reducing the need for doctor appointments and improving the limited medical coverage. In Guatemala, there is a project to monitor the nutritional status of children enabled through a "Mobile System for Monitoring Acute Malnutrition" that allows people to send text messages to monitor the nutritional status. Rio de Janeiro in Brazil, has developed a plan that implies the hiring of local teenagers for taking digital images of problematic areas in slums, so-called favelas, that allows the creation of a digital map of hot spots, and with the data collected it is possible to tackle sanitary problems as the trash accumulation and prevention of mosquitoes' concentration which are responsible for some viral diseases as dengue[42]. In Sergipe "The Telehealth Network Program"[43] aims to improve the quality of healthcare while using information and communication technologies for learning and services of basic health care; offering access to professionals in a virtual platform with remote medical consults. In Venezuela "SOS Telemedicine" offers massive open online courses – MOOCs for free for healthcare professionals in order to improve skills, network and enhance

service in remote hospitals. In Perú, the National Food and Nutrition Center – CENAN created "INS CENAN" a mobile app that helps to design a balanced daily menu.

As explained smart living technology is completely useless in developing countries and even when there is new infrastructure it can result extremely costly and that can be explained in the case of smart cities in Chile and Brazil. While the promise of Smart city Santiago, Chile[44] of exploring the different smart city dimensions the biggest critique of the project is that it became used as a touristic destination. In the case of Smart City Laguna, the project was born due crowdfunding offering a low-cost housing directed for different income brackets, and the "social" and "smart" labels are not clear enough as is not clear the percentage of the total project directed to social housing[45] and it seems to be more a market strategy to land speculation.

Figure 31. Smart City Santiago in Chile.

Figure 32. Laguna Smart city project in Brazil, social oriented.

SMART ENVIRONMENT

It concerns efficiency to reduce consumption to conserve natural and financial resources while investing in renewable sources of energy and some solutions in developed countries include the implementation of new energy systems with low power consumption, the installation of sensors on street for public lighting, the use and regulation of smart grids and the promotion of a rational use of electricity. Although Latin America and the Caribbean is plenty of environmental resources, geographical and climatic diversity, it struggles with big problems as the provision of services like electricity, access to clean water, waste management and risk management so **clean sources and access to energy** involves project that make use of available sources as sunlight and with collaboration of organizations it is possible to afford some technology for the community. For example, in La Lima, Tegucigalpa, Honduras the volunteers of program "Techo"[46] are installing together with the residents 4-watts solar panels retaining three LED bulbs with a plug and an adapter to charge mobile phones directly. In Santa Marta district, Rio de Janeiro, Brazil, smaller companies and social start-ups are installing solar panels in slums, doing use of the abundance of sun hours to increase the production of clean and low-cost energy. While in Morro da Mineira, it considers the culture of football as a social enabler and as a generator of electricity through the installation of kinetic tiles[47] or smart flooring that capture the energy generated by the players' footsteps and supply the LED floodlights in the surroundings of the pitches.

Even the availability of **water** and its **management** is limited, thus, **supply** is the biggest technical and human challenge of the century and some initiatives should include policies to incentive the responsible use, to manage leaks and losses. Nassau in The Bahamas is focused on water management; by means of a water loss detection system and the implementation of a specialized software, it allows an improvement on the management and efficiency, which is quantified in money savings and better quality of service. Also, it has developed the Sustainable Nassau Action Plan[48] that focuses on the conversion into a healthier city with the provision of new greenery, the renewal of energy sources, a zero-waste program; the urban planning for improving the local government and empowering people through strategies as digital connection and monitoring systems. Curitiba in Brazil is one of the greenest cities in Latin America and the Caribbean[49] created green spaces which during the rainy season are able to absorb runoff while on the dry season, water turns on parks.

Figure 33. Football pitch in Rio de Janeiro, Brazil, generates electricity.

Figure 34. Greenhouse in Curitiba, Brazil.

Also, **waste disposal management** has a direct impact on health, environment and quality life of people, it is connected with changes in the behaviour of the citizen with separated waste into according the materials, up to systems that support the collection, transformation and treatment of garbage both for the reduction of the municipal budget assigned and increasing the efficiency of the service and the job opportunity for people collect that material for recycling purposes. An initiative in Mexico is the monetization of waste through an "Eco wallet program", where the waste is weighed and exchanged into a sort of money called "pecos" that is redeemable at numerous affiliated establishments. In Colombia the virtual platform "Recypuntos"[50] helps people to find the nearest recycling points, teaching them how to organize waste according to the material. Furthermore, in Brazil, the initiative of "New Hope Ecotech" has generated a business system, it provides waste credit through a software platform that manages data to enable a better communication between manufacturers, that by policy should use a percentage of recycled material, recycling centres, and waste collectors that can have a stable income[51]. Itu in Brazil has implemented a selective garbage collection system in a collaboration with a public-private partnership. The system implies the use of different containers distributed throughout the city, so people can organize the garbage into recyclables and non-recyclables, and the strategy is reinforced by the Environment Secretariat's, which aim to educate the community. Also, the location of the containers, which have fill-level sensors, are connected with a monitoring system that indicates, for example, the need to repair or to replace them through specialized software, it also allows the calculation of a more efficient routing for the garbage collection, reducing time, fuel expenses and generating less traffic congestion in the process.

In the field of **risk management and disaster prevention**, it is important that some cities that are facing a higher risk of flooding due to improper soil use, landslides or earthquake, adopt a sensor-based system to monitor changes and combined with ICT are able to communicate and prevent the population. In Buenos Aires, Argentina the Unified Emergency Coordination and Control Centre – CUCC use integrated respond system to be prepared for extreme events; the same in Rio de Janeiro in Brazil; and in Perú the National Emergency Operations Center - COEN collect information of natural disasters and promulgates it.

WASTE IS CHANGED BY CREDIT TO BE USED IN ESTABLISHMENTS

SOFTWARE TO MANAGE COMMUNICATION BETWEEN MANUFACTURES AND WASTE COLLECTORS

VIRTUAL PLATFORM TO FIND RECLYCING CENTRES

GARBAGE COLLECTION SYSTEM TO PROMOTE A EFFICIENT SERVICE

LEGEND

● SMART CITIES

WASTE PRODUCTION KG/YEAR

- < 200
- 200 - 300
- 300 - 400
- 400 - 500
- >500
- NO DATA

Map 5. Innovations in environment waste management issue.

Figure 35. Monitor Centre in Perú.

SMART PEOPLE

The **digital inclusion** is possible through the provision and widening of broadband coverage, facilitating the access to information. In Favela Rocinha in Rio de Janeiro, Brazil the target was to improve internet access to people, so it has its own wi-fi provider "Wi favela" which is a collaboration between street artists and a telecom company in order to create internet hot-spots. In Chihuahua, Mexico, the city aims to empower citizens to use public spaces, promoting activities and offering new services such as the improvement of the Wi-fi coverage and promotions to access its Wi-fi for free. In Durango city, the strategy includes also educational institutions. While in Panamá with "Internet para todos" there is the provision of free internet access and installation of hotspots throughout the country.

Likewise, it is important to focus on the investment in education systems because it can improve the performance of students through the provision of new technologies and infrastructure; according to the Global Information Technology Report made in 2015 by the World Economic Forum – WEF, the impact is visible on developing regions, reducing the number of dropouts. Villarino in Buenos Aires, Argentina promotes the digital literacy with "Educación Digital Villarino" improving the education of children in development centres with the use of digital tools. Central Department of Paraguay developed a trilingual program[52] with an interactive platform so school students can learn English[53].

Also, smart solutions can facilitate innovation hubs in the community allowing the creation of new urban services; innovation laboratories enhance the design thinking and humanization of the business while urban fab labs create a collaborative network that allows the **access of new technologies** for production and digital design. In Mexico City, the project "Digital Mexico" promotes the use of ICT technologies as a tool for socio-economic development. In Bogotá, Colombia the citizen engagement with digital technologies allows the creation of collaborative networks that have resulted into projects proposals that were requested to be included in the municipal agenda such as the positioning of the city as destination for investment, technological hub and host of megaevents; the creation of an employment plan that aims to launch a public-private program in order to create new jobs; an e-government system to improve the management of the city while promoting an effective citizen platform for services; the improvement of the education system; and the development
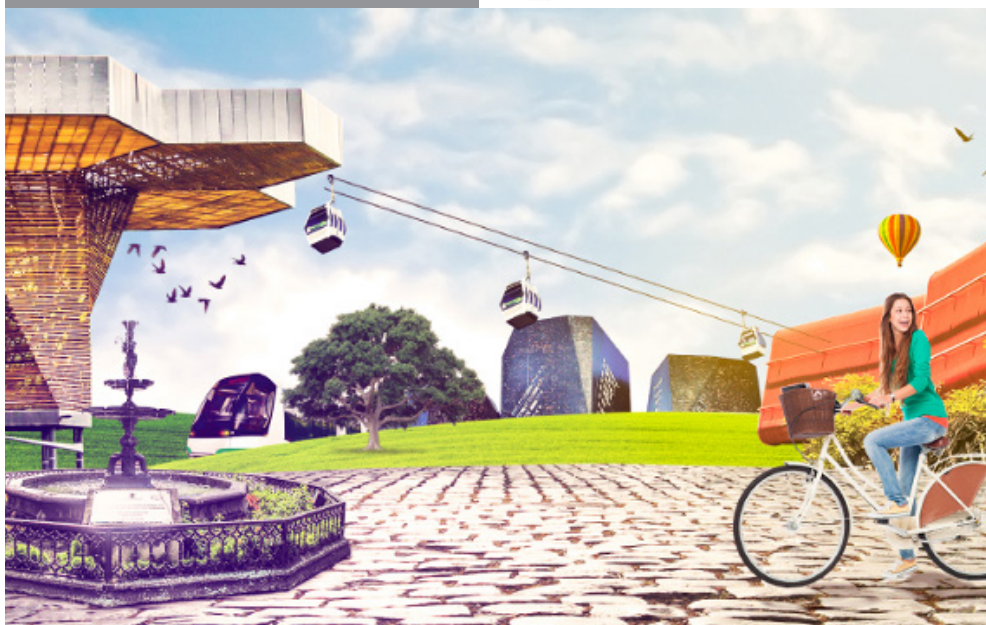
REHABILITATION OF PUBLIC SPACES
WITH FREE WIFI ACCESS

FREE INTERNET ACCESS AND
INSTALLATION OF HOT-SPOTS

IMPROVE INTERNET ACCESS IN
PUBLIC SCHOOLS

CREATION OF WIFI HOT-SPOTS WITH
STREET ART PAINTINGS

LEGEND
● SMART CITIES
INTERNET USERS
   < 25%
   25 - 40
   40 - 55
   55 - 70
   >70
   NO DATA

Map 6. Innovations in smart people - ICT access

Figure 36. Scheme of smartness in Medellín Colombia is context based.

of an urban and sustainable plan for the city in order to control the urban growth.

SMART MOBILITY

The region has an elevated number of motorized vehicles, in 2010 it had around 60 million units causing a lot of area demand in infrastructure and is estimated that in 2025 more than 80 million aditional units will be incorporated; therefore, the problems are related to traffic congestion, accidents, environmental and acoustic pollution. So, the urban innovations make use of the available technology aiming to improve the accessibility of the citizen to the urban services having an impact in the social inclusion (Jeekel, 2017); cities are promoting the use of public transport, sustainable mobility alternatives and integrating it with public spaces: from Bus Rapid Transport - BRT, integrated transport networks, applications with real-time information to sharing systems.

In Curitiba in Brazil, the policy of changing the city to really respond to citizen needs transformed into a sustainable public transport idea the Bus Rapid Transport, rebuilding the streets so people could avoid using cars. Medellin in Colombia[54] focused on the social transformation of the city through the integration of dismissed and problematic areas while implementing new public spaces and culture nodes as part of an articulated strategy that connects with the public transport system, so that citizens can regain the right to the city. The accessibility also takes into consideration the geography of the place with solutions for the flat territory "Medellin's metro" and combined with the "Metrocable", a gondola lift system. Also, there is the implementation of controversial electric staircases that aims to improve the accessibility in poor hillside communities reducing to one-fifth of the total travel time[55]. In Guatemala City the use of machines for collecting money from passengers made that bus drivers do not directly handle cash, that reduces the crime in extortion fees and together with the expansion of BRT there are an improvement and access in mobility for low-income communities. In Honduras, the "Social Keys project" allow the passenger to pay fares with a cell phone in BRT.

SMART GOVERNMENT

The application of the strategies towards a sustainable development has a strong relation with freedom of expression and democracy system, those factors can directly affect the development of innovation and as a result, smart cities are located in countries where there is flawed and full democracy; nevertheless the region is currently working on the consolidation of democracy[56],

especially on building a culture of citizen participation and improving the support on government. Some important aspects of the political innovation include: the ability of citizens to mobilize resources and organize public manifestations and initiative to pressure institutions and telecommunications, social media networks crucial for the spread of information; institutions are becoming more participatory and inclusive in order to regain trust from the public. Thus, the smart city model brings new possibilities to improve government efficiency and reputation of the public administration through the provision of digital channels which involve citizens in policy-making processes, supported by infrastructure, like free touch-points of services and training, the use information, new user-friendly apps, development of transparency policies, with services promoting e-government and commitment towards digital inclusion.

SMART ECONOMY

With the promotion of different major events related to technology and the development of innovation hubs, to promote the development of technologies, software and new business. Thus, governments are changing policies in order to stimulate young entrepreneurs and communities to do startup projects.

Figure 37. Bus Rapid Transport in Guatemala city.

Figure 38. Metrocable as geography adapted solution for mobility in Medellin.

PART 03

THE COLLECTIVE INTELLIGENCE OF LIMA, PERU

5. THE COLLECTIVE INTELLIGENCE OF LIMA

Innovation is considered to be a driver of economic growth and by analogy, local innovation is the driver of local development and growth; it is understood as an open process with firms seeking for ideas, contacts and learning opportunities. In the same discourse, urban innovation focuses on creating values for the city and helps to deal with the problems a city is experiencing while taking into consideration the citizen's needs (Shearmur, 2012). The outcome can be an object or a way of doing that previously did not exist. It is a learning process of turning knowledge and ideas into a value and is related to the city, thus new industries emerge in large cities altering the urban order as products become standardised and networks are more stable.

An ecology of innovation is a complex system that allows the creation of knowledge (Dvir & Pasher, 2004) and cities concentrate the creative talent of inner synergies and community works with limited resources to find valid solution to problems; representing the intellectual capital of the city that can promote urban innovation and projects in collaboration with different actors like private business, local institutions, public bodies, that altogether constructs an urban collective, the vision for better sustainable city (Nonaka, Ikujiro; Konno, 1998).

So, in the next section, the case of Lima is going to be presented, in order to understand that collective and sometimes invisible networks can generate smart solutions.

PERU
31.8 MILLIONS

CHICLAYO
582 THOUSANDS

TRUJILLO
814 THOUSANDS

LIMA
10.2 MILLION

AREQUIPA
888 THOUSANDS

Map 7. Most populated cities in Perú.

5.1

PERÚ AND SUSTAINABILITY CHALLENGES

Perú is a diverse country in terms of geography, cultural and economy and it has an unequal distribution of the population and big social issues. The major urban areas are the cities of Lima, Arequipa and Trujillo.

The economy is based on the extraction of primary resources as minerals, fishing and agriculture; and some issues are related to the promotion of responsible investment in the financial sector, as the Responsible Investment Program – PIR, and the creation of synergies between public and private sector in order to have an impact on the global climate agenda; as the initiative Lideres+1 that aims to create a network of entrepreneurs devoted to sustainable development through the promotion of innovation and a systemic circular economy business. Finally, related to mobility there is the promotion of sustainable transport as well as the development of efficient transport networks; such as also the investment in the Metro Line and the inclusion of the urban transport as a priority in the National Appropriate Mitigation Actions – NAMA.

Although the country has high environmental vulnerability level due to the fragility of the diversity of ecosystems and its association with poverty and inequity (Ministerio del Ambiente, 2015), after understanding that cities which grow unplanned are responsible for higher demand for services and goods and increase GHG emissions, there is a notable commitment and progress in the field of sustainability, and results are visible especially since the Climate Summit - COP20 where the national commission presented initiatives towards the preservation and conservation of the natural ecosystem, resources management, engagement between the public and the private sector in the national level[57] and the reinforcement of regional agreements in Latin America and the Caribbean.

For example, the development of the National Environmental Action Agenda, "2015/2016 Agendambiente"; the National Forest Conservation and Climate Change Strategy which tackles deforestation due to land use change and together with the National Strategy against Climate Change it is promoting the urban planning towards the resilience on cities and a low carbon emission that can ensure a sustainable development. In the area of suitable use of resources, the participation on the Paris Pact on Water and adaptation to climate change committed to increase resilience of basins of rivers, lakes, aquifers and deltas and to reduce human interference in the oceans; the development of monitoring systems, the promotion of financial sustainability and new investments for the management of the water system.

But also, it projects the adoption of tools to measure deforestation and carbon emissions as other countries as Brazil, Ecuador, Colombia and Mexico have already done.

SMART CITY
Nevertheless, the country lacks indicators in order to monitor the development of smart city (International Trade Administration of the Department of Commerce, 2016). The rising crime rates, traffic issues, corruption and loss on trust in public institutions, limited access to technologies and climate change represent some of the challenges for the smart city and the government has started to develop some strategies towards a vision of a modern, inclusive and resilient country.

In the area of risk management, the National Institute of Civil Defence – INDECI supports the National Emergency Operations Centre – COEN[58], that monitors, collects and analyses information about risk and natural disasters, since Perú is predisposed to earthquakes and landslides, and communicating to the public in order to prevent, to evacuate and develop emergency plans. Likewise, the development of the "Technical Code for Sustainable Construction"[59] and lately approved in 2015, in order to promote the minimum standards related to energy and water use management for new buildings for housing and commercial uses, as part of the agreements made in the COP20[60] and it demonstrates the commitment to the government towards a sustainable development and reduction in carbon emissions (International Trade Administration of the Department of Commerce, 2016); the implementation is gradual since 2016 in the main cities of the country. It was realised in collaboration with the Canadian cooperation program CAMBER that is supported by the Canadian Department of Foreign Affairs, Trade and Development (DFATD); as part of the International Finance Corporation – IFC, member of the World Bank Group[61]. The management of the project implied the conformation of a technical commission, Permanent Committee on Sustainable Construction, and include the Ministry of Housing, Construction and Sanitation, the Ministry of Environment and the Ministry of Energy and Mining, and other institutions related to design, construction and real estate as the Peruvian Construction Chamber - CAPECO and the Peru Green Building Council - Peru GBC; the academia, with most important universities that have research centres related to the field; the industry with the National Society of Industries, and the civil society as the Architect Association and the Engineers Association of Perú.

Another important step on the road towards the smart city model is the projection of the digital inclusion and information and knowledge society – IKS; in 2001 the "Action Plan for the massification of internet in Peru"- was a proposal for a digital action plan, elaborated by a commission of 7 ministries and a private institution; and it was focused on ICT connectivity[62]. Later in 2006, the Multisectoral Commission for the Development of Information Society - CODESI, developed the "Action Plan for the development of an Information and Knowledge Society" with the aim to guarantee the access to ICT.

In 2011, the national government launched its digital agenda, Agenda Digital Peruana 2.0, in order to promote the digital integration while transforming into an information-based society. It is grounded in the idea that ICTs are not a mean but tools to achieve multiscale development goals; thus it has 8 goals and its strategies to be implemented through actions, projects and activities in collaboration with the government, industry, academy and the civil society (Comisión Multisectorial para el Seguimiento y Evaluación del Plan de Desarrollo de la Sociedad de la Información en el Perú - CODESI, 2011). Thus, the Ministry of Transports and Telecommunications has the principal responsibility for the implementation of

Figure 39. Program one laptop per child allows the digital inclusion in rural areas.

Figure 40. The access of free wifi is limited to the most touristic districts.

those goals developed the "Master plan of development of ICT infrastructure and new trends that promote the construction of smart cities". The policies are related to e-government, the promotion of e-commerce, the control and protection of digital data, the protection of fundamental and privacy rights. The objectives are framed into a medium-term policy to be achieved up to 2015 and comprehends:

- To ensure inclusive and participatory access to the IKS
- Integrate, expand and ensure the development of competencies for the access to the IKS
- Guarantee better opportunities for the use of ICTs that ensure social inclusion, access to social services that allow the full exercise of citizenship and human development in full compliance with the Millennium Development Goals
- Promote scientific research, technological development and innovation based on national development priorities
- Increase the productivity and competitiveness through innovation in the production of goods and services, with the development and application of ICT
- Develop the competitive and innovative national ICT industry with an international presence
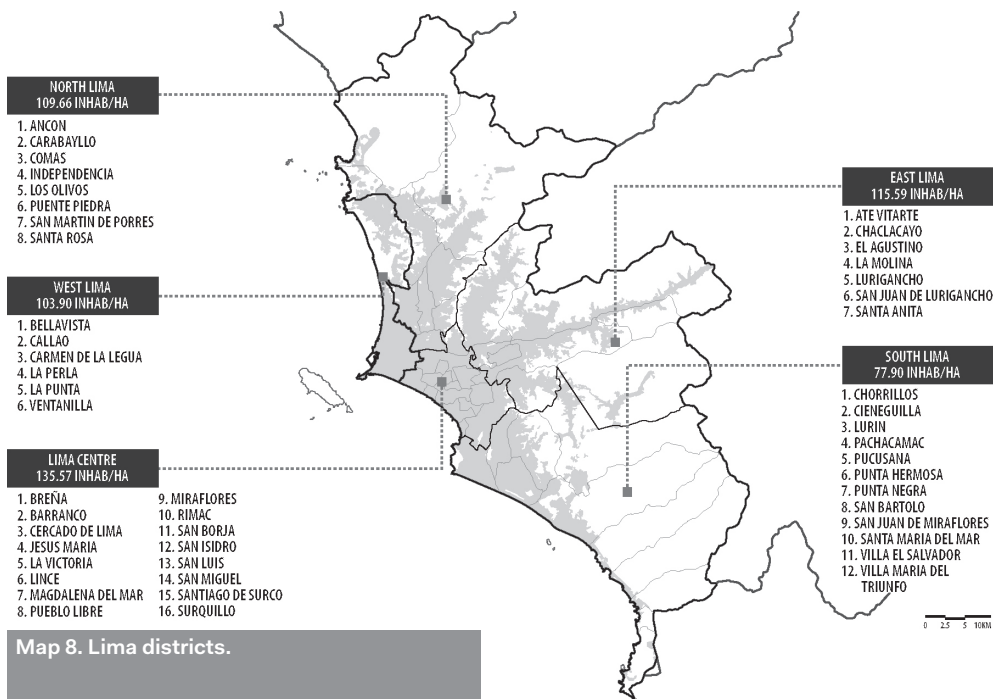- Promote a public Administration of quality oriented to the population
- To ensure that the proposals of the Peruvian Digital Agenda 2.0 are inserted in local, regional, sectoral and national policies in order to develop the IKS.

In the area of economy, recent reports by the Global Entrepreneurship Monitor - GEM, which evaluates around 60 economies around the world, reveal that the country has the ability to develop creative solutions[63] to complex problems and entrepreneurial asset but still, it remains in the group of efficiency-driven economies (Global Entrepreneurship Research Association - GERA, 2017). Thus, the Ministry of Production is implementing some initiatives towards the promotion, development and consolidation of new businesses, start-ups, that will be able to offer innovative products and services that are based on ICT (Khoury Escudero, 2014) and that has projection to international markets, as the program "Innóvate Perú"[64] and Start-up Perú[65] since 2013, a platform of collaboration network and it offers contest and financing opportunities.

LIMA

The investment in large cities in Latin America and the Caribbean have had a main role in the development of the demography and businesses; and brought along a high demand for the urban space, which caused the overflow of administrative boundaries plus conurbanization of other urban centres (Programa de las Naciones Unidas para los Asentamiento Humanos - Oficina Regional para América Latina y el Caribe, 2012); as a response, urban areas of large territorial dimensions have been formalized into metropolitan regions[66]; like the Metropolitan area of Lima in Perú, constituted by the provinces of Lima and Callao and the interdependence in terms of functionality[67]: the Constitutional Province of Callao depends on the mobility infrastructure, economic, productive and financial dynamics of Lima Province, especially from the city of Lima, while the last one depends from Callao on the services for foreign trade and the two important global communication points: the Callao port and the International Airport Jorge Chavez.

NORTH LIMA
109.66 INHAB/HA
1. ANCON
2. CARABAYLLO
3. COMAS
4. INDEPENDENCIA
5. LOS OLIVOS
6. PUENTE PIEDRA
7. SAN MARTIN DE PORRES
8. SANTA ROSA

WEST LIMA
103.90 INHAB/HA
1. BELLAVISTA
2. CALLAO
3. CARMEN DE LA LEGUA
4. LA PERLA
5. LA PUNTA
6. VENTANILLA

LIMA CENTRE
135.57 INHAB/HA
1. BREÑA
2. BARRANCO
3. CERCADO DE LIMA
4. JESUS MARIA
5. LA VICTORIA
6. LINCE
7. MAGDALENA DEL MAR
8. PUEBLO LIBRE
9. MIRAFLORES
10. RIMAC
11. SAN BORJA
12. SAN ISIDRO
13. SAN LUIS
14. SAN MIGUEL
15. SANTIAGO DE SURCO
16. SURQUILLO

EAST LIMA
115.59 INHAB/HA
1. ATE VITARTE
2. CHACLACAYO
3. EL AGUSTINO
4. LA MOLINA
5. LURIGANCHO
6. SAN JUAN DE LURIGANCHO
7. SANTA ANITA

SOUTH LIMA
77.90 INHAB/HA
1. CHORRILLOS
2. CIENEGUILLA
3. LURIN
4. PACHACAMAC
5. PUCUSANA
6. PUNTA HERMOSA
7. PUNTA NEGRA
8. SAN BARTOLO
9. SAN JUAN DE MIRAFLORES
10. SANTA MARIA DEL MAR
11. VILLA EL SALVADOR
12. VILLA MARIA DEL TRIUNFO

0   2.5   5   10KM

Map 8. Lima districts.

5.2

THE URBAN CHALLENGES OF LIMA

Lima city is the capital of Perú and it has a locational advantage in comparison to other cities in South America, because is at the same time a big metropolitan area and important port in the Pacific Ocean; it collects all the important national production for exports and it is projected to serve as important node of financial, commercial and service flows between Asia and South America. On the other hand, the airport is the main entrance to the country from the exterior and it is ruled by tourism and trade. The metropolitan area is the main national node of consumption, distribution and production; it has a strong function in the connection of north and south cities and even with the central region in the Amazon axis due to the Central road, paved from Callao to the Ucayali river.

SOCIOGEOGRAPHY

As the history of the urbanization and distribution of services in the city, it is possible to identify 5 main areas each one with different functions for the metropolis: North Lima, South Lima, East Lima, West Lima and Lima Centre.

North Lima, it was the first cone to develop economically and socially and its population comes from the north of the country and many of them migrated in the 70s due to the agrarian reform. The main connection axis is the Pan-American road, Universitaria avenue and
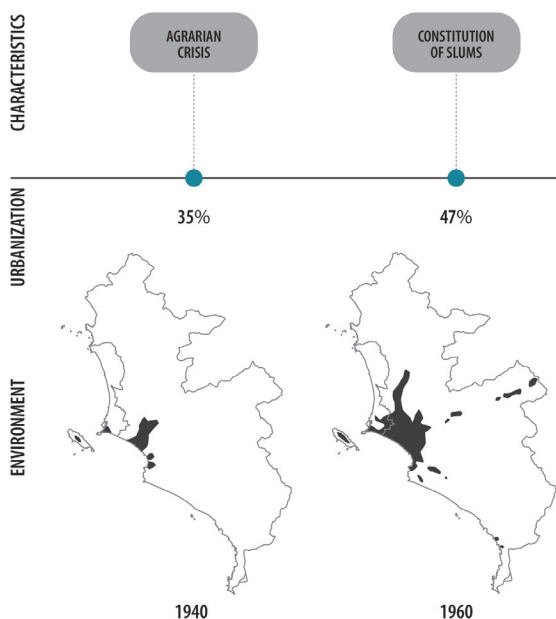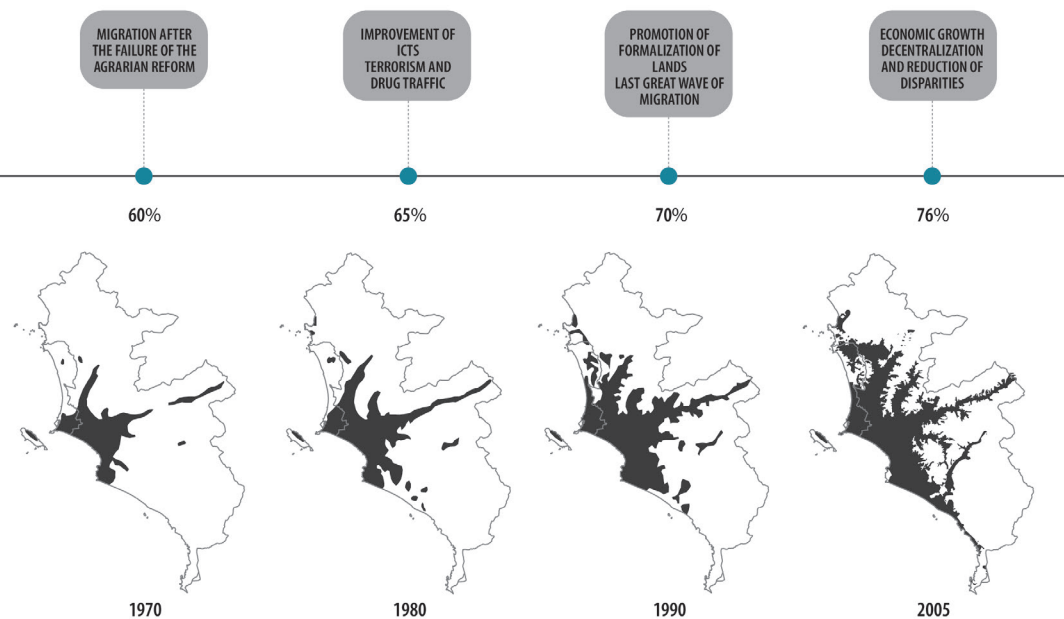
CHARACTERISTICS

AGRARIAN CRISIS

CONSTITUTION OF SLUMS

URBANIZATION

35%

47%

ENVIRONMENT

1940

1960

Figure. Urbanization timeline in Lima.

Tupac Amaru avenue, it concentrates important housing areas and it has gained major importance after the construction of big commercial centres such as Megaplaza, that promoted the construction of another, Lima Plaza Norte and the formalization of the Bus Terminal.

South Lima, represents the first invasion that gave origin to the growth of the city, it developed significantly around 20 years ago, and most of its inhabitants come from the southern Andes, many of them in the last wave of refugees from terrorism. Some of the important points are the productive furniture industry, the Industrial Park in Villa El Salvador, San Juan de Miraflores and Villa María del Triunfo.

In East Lima migrants come from the central highlands of Perú and it is the most heterogeneous area: it presents

MIGRATION AFTER THE FAILURE OF THE AGRARIAN REFORM	IMPROVEMENT OF ICTS TERRORISM AND DRUG TRAFFIC	PROMOTION OF FORMALIZATION OF LANDS LAST GREAT WAVE OF MIGRATION	ECONOMIC GROWTH DECENTRALIZATION AND REDUCTION OF DISPARITIES
60%	65%	70%	76%
1970	1980	1990	2005

invasions, ancient ones as El Agustino, relatively recent as Huaycán; formal urbanizations along the Central Road; but also, high-class neighbourhoods as La Molina, what increments the tensions. The most populated district at the local and national level, San Juan de Lurigancho, is in this area. The main axis is the Central Road then Ramiro Prialé Road and from north to south Evitamiento road/Panamericana Sur and, it has important commercial and convention centre, the Jockey Plaza.

West Lima is the area that connects the city centre with the industry and other facilities connected to the airport and port; it also concentrates population from the coast of Perú.

Lima Centre where the city was founded, it concentrates the most consolidated districts with high density and access to urban services. Even though, there is a contrast on the quality services in the area, Cercado de Lima is the traditional historical centre and it concentrates the most important national institutions as the Government Palace, the Congress, the Courthouse of Lima, the Cathedral, Archbishop's Palace of Lima different ministry's, the Metropolitan Municipality of Lima; at mobility level it has the Central Station of the Metropolitan Bus of Lima. On the other hand, new districts as San Borja represent the archetype of the new middle class of Lima, and that has an important convention area formed by the National Library, the Ministry of Education, the National Theatre and the National Bank of Perú with strategic connection with the metro. The main axis is Javier Prado avenue, Brazil Avenue and Arequipa Avenue.

SUSTAINABILITY CHALLENGES

According to the Metropolitan Municipality of Lima(2015), the urban occupation of the territory and its level of consolidation have a direct impact on the quality of life of the inhabitants because Lima presents a clear urban, social and economic stratified development. Since its foundation, the city has been a city of migrants while the flow is still positive the percentage has diminished[68] in comparison to the wave of migration that took place in the second half of the twentieth century and the city population is projected to grow around 1.35% (Instituto Metropolitano De Planificacion, 2014). While Lima Centre concentrates the larger resources[69], access to services, equipment and transportation it also has higher quality urban standards; in the opposite, the peripheral and vulnerable areas have the fewest resources and consequently the urban occupation generates higher costs for the development of infrastructure and the provision of basic services, which contributes to the social vulnerability.

The mobility issue is complex due to several factors: the presence of an obsolete auto-motor park, the privatization of the public transport system, a massive public transport fleet made up of old and small units, an oversized fleet of taxis, the superposition of multiple routes, which triggers an

3 379.5 in/km2

LIMA
TOTAL TERRITORY

13 761 in/km2

LIMA + CALLAO
POPULATED AREA

UNIVERSITARIA

SAN ISIDRO

MIRAFLORES
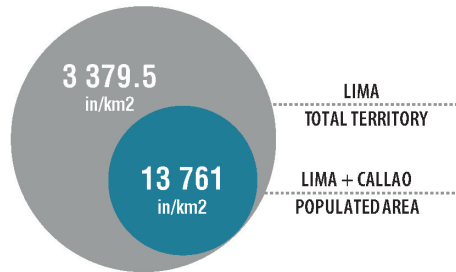
LEGEND

- LOCAL CENTRALITY
- INTERDISTRICT CENTRALITY
- SPECIALIZED CENTRALIY
- METROPOLITAN CENTRALITY
- ADMINISTRATION
- LOGISTIC
- FINANCES
- SERVICE
- COMMERCE
- PRODUCTION
- INDUSTRY

Map 9. Local centralities in Lima.

PRO

NARANJAL

TOMAS VALLE

FAUCETT

CANTO GRANDE

ZARATE

CERES

SANTA ANITA

BELLAVISTA

CALLAO

MONTERRICO

LIMATAMBO

BARRANCO

ATOCONGO

CHORRILLOS
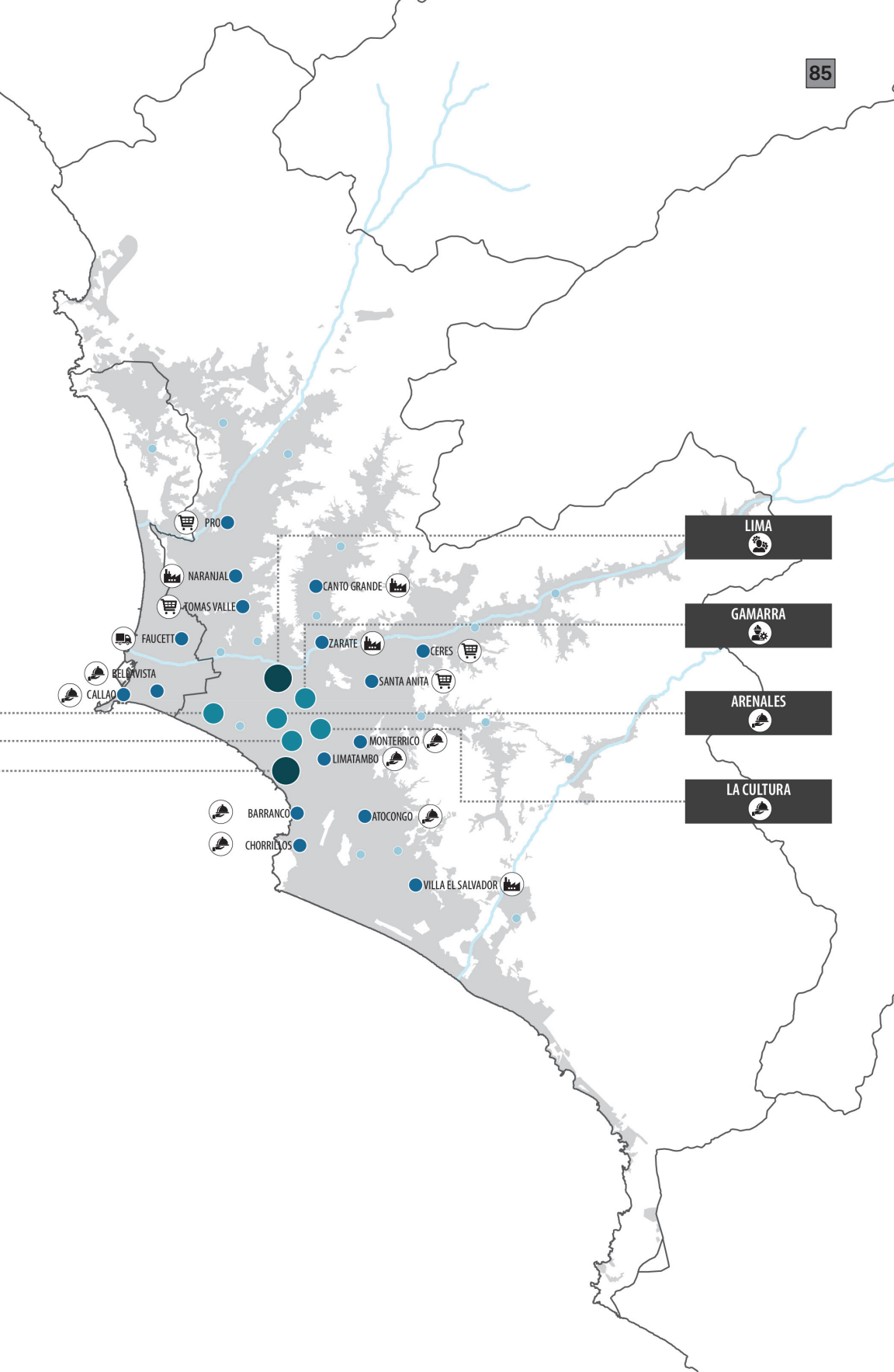
VILLA EL SALVADOR

LIMA

GAMARRA

ARENALES

LA CULTURA

inefficient, low quality and polluting transportation service. It is the main source of gas emissions, related to the consumption of diesel and gasoline in the transport sector (36% of total emissions); and followed by the manufacturing industry and the construction sector (32%); energy consumption with electric power of housing, commerce and institutions (18%) and landfill emissions (14%).

Also, the city is vulnerable to the effects spontaneous urbanization especially because of three aspects: water provision, energy provision and risk management. Even if the city has three main rivers, Chillón, Rímac and Lurín, there is a tendency to decrease the rainfall due to deglaciation and over-exploitation of aquifers; and an increasing demand of water due to urbanization factors and density, which is reflected in the precarity of the service and old infrastructures. In the other extreme, floods are associated with extreme precipitation and it has a devastating effect in the housing of populations located along the water bodies and is also due to the absence of a governmental regulatory institution; it affects the vital infrastructure such as the hydroelectric power plants located in the course of The Rímac River[70]. According to the Regional Plan of Concerted Development 2012-2025, it is estimated that around 660 000 people are at very high risk to suffer from slopes and 30% of them are mostly located in Lima Norte (Carabayllo, San Martin de Porres and Los Olivos) and Lima East (San Juan de Lurigancho, Chosica, Chaclacayo).

In the area of the economy, Lima is one of the most competitive cities at the national level in aggregate terms but still presents shortcomings related to the institutional dimension, logistics and human capital in order to consolidate its regional and international level. Likewise, some of the challenges that the economy has to deal are related to the infrastructure and the missing of productive centres as industrial parks, the business equipment as convention centres and fairgrounds; people behaviour and the high rate of informality trade plus the low technical qualification.

Nevertheless, the vision of the city is related to culture and sustainability, as an organized place and secure with an inclusive and entrepreneurial society, by means of being recognized as touristic centre and services in the South Western Pacific basin (Municipalidad de Lima Metropolitana, 2016). The urban management goals of the city includes explicitly the improvement of citizen security, a change in the citizen behaviour towards a culture of inclusion and respect, increase in the competitiveness and formalization

of business networks, reduction of environmental pollution waste management and better accessibility of services and mobility (Instituto Nacional de Estadistica e Informatica (INEI), 2014). The concept of the smart city is a valid tool to achieve those goals as it is described and suggested in the Metropolitan Plan for Lima and Callao – PLAM 2035[71] due to its correlation with better management of resources, efficiency and sustainable development and with relation to the approach of the national digital agenda.

Figure 41. Wall divides on the othe richest neighbourhoods with the poorest slum.
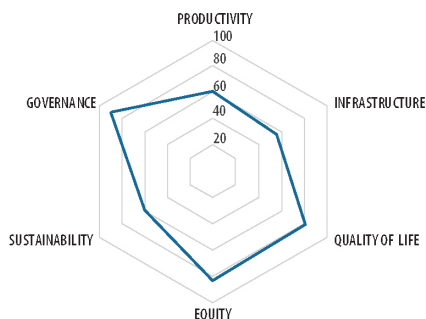
Figure 42. IESE index of Lima.
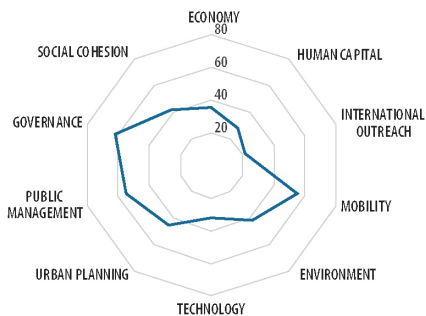
Figure 43. CPI index of Lima.

5.3
THE COLLECTIVE INTELLI-GENCE OF LIMA

Lima city can be described in three adjectives: spontaneous because of its urbanization and extension; flexible due to its continuous adaptation to demand flows; diverse by the cultural background of the inhabitants (Inteligencias Colectivas Red de Centros, 2012).

SMART LIVING

There are two processes of urbanization and its impact on the territory, on one hand the formal urbanization takes places in areas of the city where the urban infrastructure and access to services are consolidated, plus densification brings along problems where infrastructure is obsolete and causing leakages; or construction of new residences pretty far from the centre which generates a dependence of the private mobility and the increase in the demand of resources, water supply, electricity and others. On the other hand, informal settlement takes place in areas where the quality of land difficult the investment of infrastructure doing it costly and vulnerable because are located on a hill with a high slope, along rivers, near cliffs and unstable soils (Inter-American Development Bank, 2016). As a response to some urgent problems community has developed social organizations and committee for sharing services, even if informally, as electricity, water; and aiming to improve the communication

with local governments, as well as the search for programs for slum upgrade, construction of infrastructure and inclusion of public spaces.
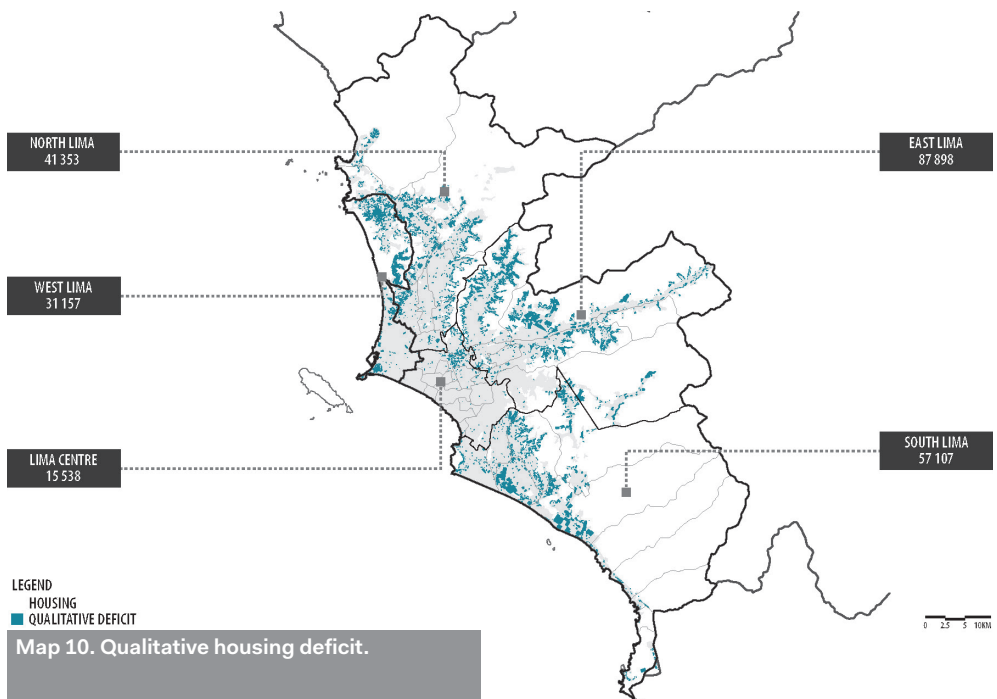
A solution for tackling the problem of food is the organization of community dining room which represents also spaces for socialization and civic learning, for interaction and negotiation in the search of equity, identity and inclusion and question the family roles promoting the feminine social development (Portilla Salazar, 2013).

In the case of improving the life in community, there are some activities organized both for the academia and inhabitants of some dismissed areas as the case of the International Festival of Theatre in open streets – FITECA, which considers the cultural diversity due to migration and actual dynamics to transform the neighbourhood through recreational and cultural activities encouraging participation in the improvement of local infrastructure. So, in collaboration with cultural associations, architects and citizens work into collaborative design and construction on community work days[72].

In the area of citizen security initiatives goes from the organization in the community to municipal centres of monitoring. In small neighbourhoods, there are some networks of watchmen,

or "wachimanes" that are people that without a weapon, exchange information through mobile phones, register incidents and patrol the area in exchange of money and it is generally managed by the private business. With the same logic, the municipalities have developed the network of "serenazgo", as sort of upgrading of the system and in recent years with the use of ICT some districts have control and monitoring centres and, in some cases, there are mobile apps that allow the communication between local security forces, but the system is independent of the different district and constrained to the municipal budget[73]. An independent example of social network devoted to tackling robbery is "Reach"[74] a platform for mobile phones and tablet based on geolocation that stimulates the citizen participation; based on integral security it improves the communication between authorities and citizens, social security due to the use as social network and personal security, so the user can add contacts who share real-time location[75].

NORTH LIMA
41 353

EAST LIMA
87 898

WEST LIMA
31 157

LIMA CENTRE
15 538

SOUTH LIMA
57 107

LEGEND
HOUSING
QUALITATIVE DEFICIT

Map 10. Qualitative housing deficit.

0   2.5   5   10KM

SMART ENVIRONMENT

In Lima there is around of 3.7m2 of the green area by inhabitant (Lima Como Vamos observatorio ciudadano, 2014), below the minimum required by the World Health Organization - WHO, so the municipality is investing in the improval of zonal parks[76] in the north and south, aiming to convert them into cultural poles, enhancing the identity and improving the quality of life of the citizens.
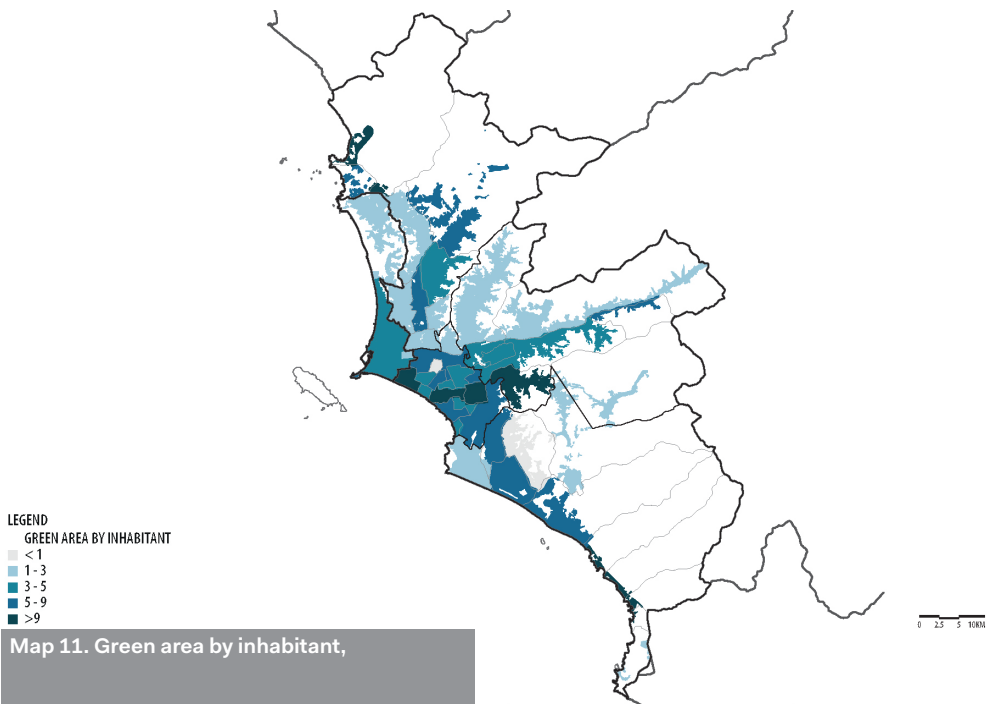
The program "Mi Huerta"[77] is a metropolitan program of urban farming and food security implemented since 2012 and officialised in 2014, with the aim of reduce the rates of chronic malnutrition and anemia in children, increase the number of green areas and empower school students, families and community in general towards a better behaviour regarding food education and consciousness of the environment. Through the supply of technical support, training, seeds and tools to produce crops in an agroecological way.

Due to the invisible inequity in the use of the public space (Vega Centeno, 2017), some initiatives in public space reinforces the collaboration between community and government even if the use of technology is not a visible the urban innovation the change in the process relays in the shift towards a collaborative net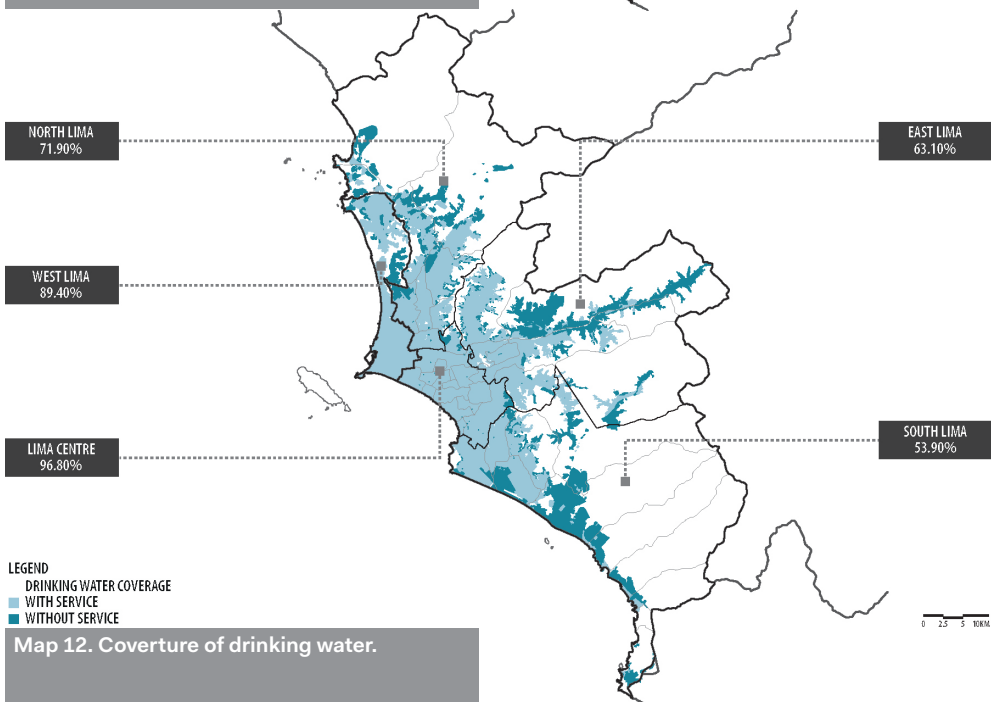work bringing new tools to the citizens. For example, the case of the municipal program "Barrio Mio"[78] offers technical assessment for neighbourhoods in hills to generate projects of urban regeneration and improvement of public spaces, focused in citizen participation as self-management tool, promoting the transformation of neighbourhoods as organic nuclei inside the city. Also, there are small interventions promoted by the citizens and supported by universities, as the program "Ocupa tu calle"[79] that aims to intervene in underused areas of the city in order to increase the number and quality of public spaces, with itinerant modules made of recycled materials to shape urban furniture and bring new social public spaces.

The plan of "Mitigation of disaster risk in east Lima" promoted by the municipality covers four districts: Chaclacayo, El Agustino, Ate and San Juan de Lurigancho with the development of contingency plans, drills and capacitation of the vulnerable population; and infrastructure construction of roads and stairways to improve accessibility, retaining walls to prevent landslides, arborization to improve the soil quality and stone untying to reduce risk of accidents.

In the case of waste management, there are several problems that involve the reduced municipal budget for

LEGEND
GREEN AREA BY INHABITANT
< 1
1 - 3
3 - 5
5 - 9
>9

Map 11. Green area by inhabitant,

0 2.5 5 10KM

NORTH LIMA
71.90%

EAST LIMA
63.10%

WEST LIMA
89.40%

SOUTH LIMA
53.90%

LIMA CENTRE
96.80%

LEGEND
DRINKING WATER COVERAGE
WITH SERVICE
WITHOUT SERVICE

Map 12. Coverture of drinking water.

0 2.5 5 10KM

manage the collection of waste and together with a culture of informality and breaking rules, together it makes the situation more difficult and generates chaos and disorder (Lima Cómo Vamos Observatorio Ciudadano, 2016). The difficulty in the collection has created a network of collectors that go around neighbourhoods and do the work, but it generated informal garbage dumps. In that system, people found waste and materials as an opportunity for work waste collectors generated a synergy with recycling business. Thus, the municipality through diverse policies is organising supervision and control of transport operators of solid waste, using information from people in order to identify the weak points of collection in districts and if they cause problems on public roads, up to the formalization of waste collectors with the aim to associate them, offer training, sanitation access and identification id, long different awareness campaigns in schools and communal public spaces promoting the change in behaviour in people, promoting the separation of waste by materials and recycling (Gerencia de Servicios a la Ciudad y Gestión Ambiental, 2016).

Besides, in order to improve the access to healthcare in poor neighbourhoods, "Hospital de la Solidaridad" is an initiative of the Municipality of Lima that transformed old inoperative buses into

doctor offices and offering campaigns of prevention in mobile itinerant hospitals in containers and buses expanding the cycle life of them, and are characterized for being dynamic and located in different public spaces such as squares, streets and sports slabs, either temporarily or permanently; changing the sensory perception and making the hospital environment more pleasant since it can be associated with open public space. Today, the network has been expanded in another seven regions of the country[80].
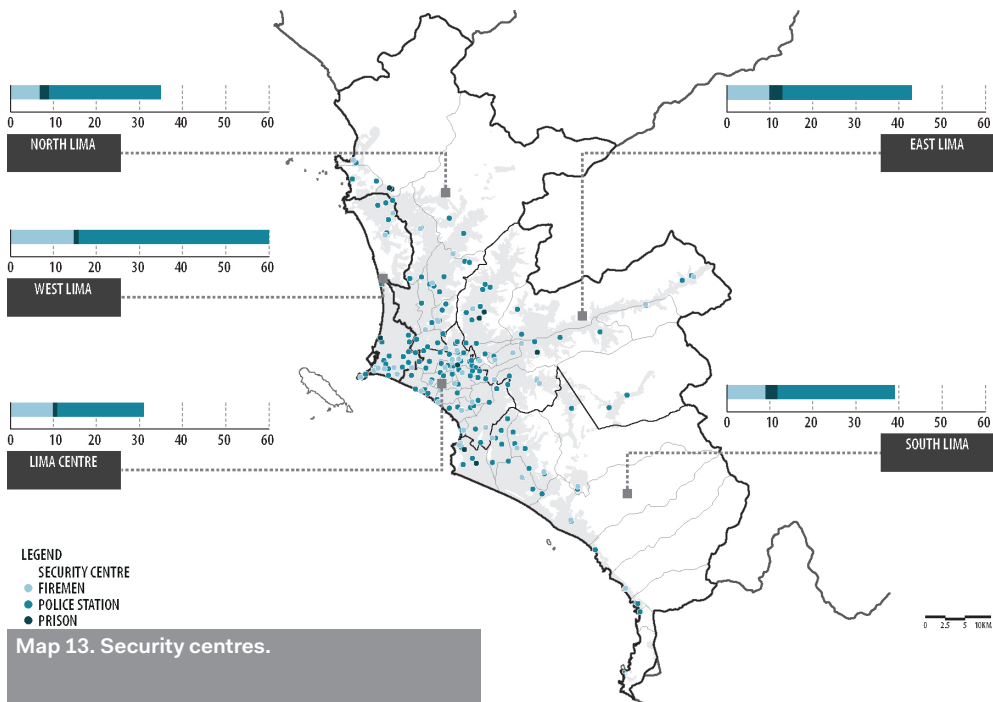

Figure 44. Security app.

NORTH LIMA

WEST LIMA

LIMA CENTRE

EAST LIMA

SOUTH LIMA

LEGEND
SECURITY CENTRE
● FIREMEN
● POLICE STATION
● PRISON

0   2.5   5   10KM

Map 13. Security centres.

Figure 45. Fiteca in La Balanza promotes the involvement of the community and design.
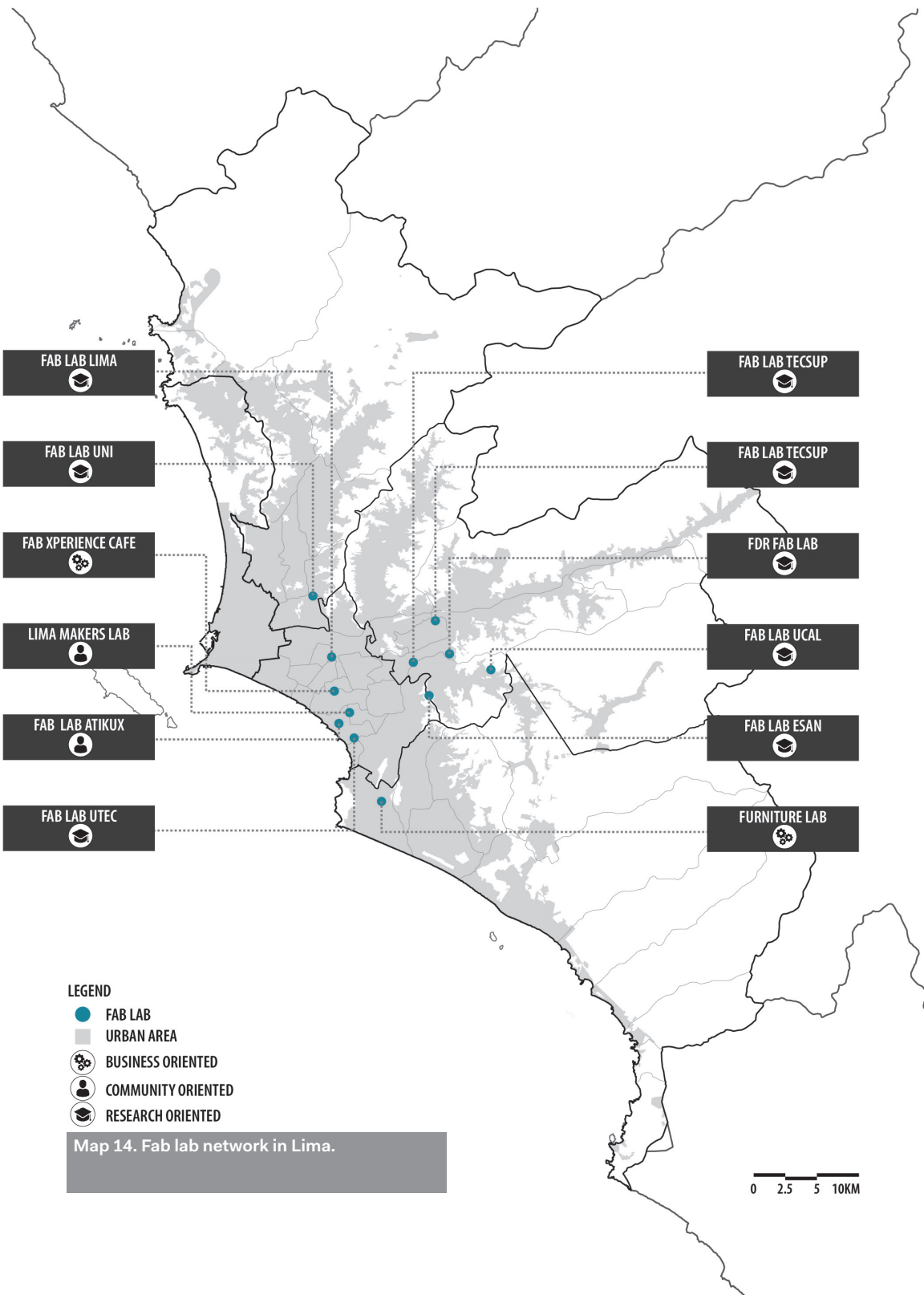
SMART PEOPLE

Digital inclusion means to take into consideration and analysing the perception of people that face inequalities and how ICT can contribute to empowering the community in the way they express and face both social and digital inequalities. Even with the high diffusion of the telecommunication, not all households have had a phone in the 90's and there was a reduced access to the internet; in the last decade the spread of smartphone increased, but the quality of the service still is an issue (Hollands, 2008).

In that sense, Lan houses and Telecentres contributed to the expansion of the internet coverage and represents an affordable way to stay connected, since they work as interaction space; social media acts as a platform for organizing and manifest protests (Nemer, 2016). To stay connected people also developed also a sort of mobile- sharing while offering the rent of mobile phones and getting money from minutes of call in 2007. Also, "Cabinas" represented a new type of urban facility allowing the connection to the internet in collective places, they are sort of cybercafés for middle and lower income groups that cannot have the service at home (Fernández-Maldonado, 2004). Nowadays the citizen requirements have changed into better quality of internet connection, but the system is valid in different cities in the country where internet is expensive and unstable.

Although there is another type of collaborative networks that constitute the productive areas of the city, some of them are in the mode of thematic streets of commerce, which solutions are frugal and conform organic systems. Some neighbourhoods are dedicated to reusing of materials or are specialized and having "in time" production due to the limited availability of space(Inteligencias Colectivas Red de Centros, 2012). Thus, urban laboratories can produce changes promoting the use of both the collective intelligence of people and the combination of digital fabrication and prototyping.

FAB LAB LIMA

FAB LAB UNI

FAB XPERIENCE CAFE

LIMA MAKERS LAB

FAB LAB ATIKUX

FAB LAB UTEC

FAB LAB TECSUP

FAB LAB TECSUP

FDR FAB LAB

FAB LAB UCAL

FAB LAB ESAN

FURNITURE LAB

LEGEND
FAB LAB
URBAN AREA
BUSINESS ORIENTED
COMMUNITY ORIENTED
RESEARCH ORIENTED

Map 14. Fab lab network in Lima.

0 2.5 5 10KM

WORKSHOP + PRODUCTION

GOVERNMENT INVESTMENT - MINISTRY OF
PRODUCTION
COLLECTIVE NETWORKS

CITE - TECHNOLOGICAL INNOVATION CENTRE

PRODUCTIVE AGGLOMERATION:

PUBLIC ENTITIES FOR STANDARIZED
PRODUCTION THAT ENABLES INFORMAL
NETWORKS OF PRODUCTION.

**CAQUETA
FOOTWEAR PRODUCTION**

**VILLA EL SALVADOR
WOOD AND FURNITURE
PRODUCTION**

THEMATIC STREET MARKETS

FRUGALITY IN USE OF PUBLIC SPACE TO FOR
THE PROVISION OF DAILY PRODUCTS.

**PARURO STREET
ELECTRONIC PRODUCTS**

**GAMARRA STREET
VERTICAL PRODUCTION
CHAIN**

TACORA NEIGHBOURHOOD - REUSE OF WASTE

RE SELL OF CONSTRUCTION MATERIALS
PRODUCTION WORKSHOPS

REDUCTION OF GRAY WASTE

**INVENTIONS MADE WITH
RECYCLED MATERIALS**

Figure 46. Collective intelligence networks in
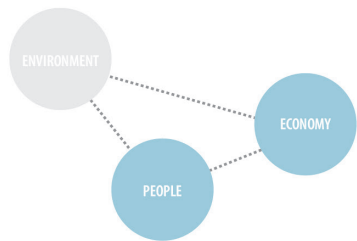Lima related to productivity.

SMART + SUSTAINABLE

46 CITE

27 PUBLIC
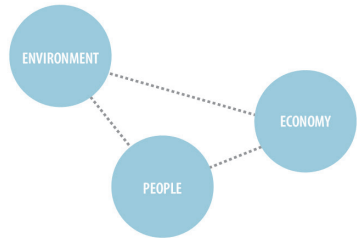
19 PRIVATE

**TECHNOLOGICAL TOOLS
AND ENTREPENEURSHIP**

ENVIRONMENT

ECONOMY

PEOPLE
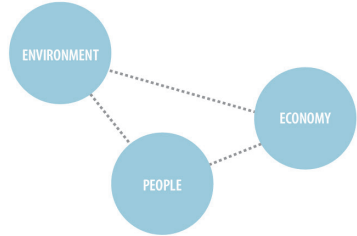
**ANSWER TO EMPLOYMENT NEEDS
SPATIAL AGGLOMERATION**

ENVIRONMENT

ECONOMY

PEOPLE

WASTE MANAGEMENT

ENVIRONMENT

ECONOMY

PEOPLE

**FORMALIZATION IN
"VIRGEN DE COCHARCAS"
ASSOCIATION**

**STANDARIZATION OF
SUCCESSFUL PROTOTYPES**

SMART MOBILITY

Lima urban expansion was mainly through popular neighbourhoods known as slums in Lima North and South and its inhabitant's needs are satisfied by complementary areas located in the central area of the city; so people created informal transport services that even with quality problems it was a response to the displacement needs of the new popular sectors; thus the public transport system Public transport has also an important role in the social inclusion (Vega Centeno Sara Lafosse, 2014). According to Jordi Marin[81] the transportation is the big problem of Lima but adopting a smart city strategy can improve the situation due to the capacity to gather information, so citizens can be able to better know the transport network, schedules, availability of parking lots; at infrastructural level, the installation of smart traffic lights, sensors but also is important to promote the use of sustainable transport. In that sense, smartness comes from people, a business that works with data to make decisions, public transport reform, the inclusion of bikes to smart stops.

"Datero"[82] is a sort of informal profession that literally means someone that gives data, being aware that information has a monetary value, people created a system of calculating the distance in time from one bus to another that shares the same route, also

the quantity of people inside, so business works with data, considering significant metric and taking decisions[83], so drivers can accelerate or slow down to improve the business. The response has an origin in the 90's the public transportation is managed by a private business that has had a concession of routes together with a high demand for transport and unemployment. There are still some "dateros" near the bus stops and they represent a valuable source of information for both passengers and business; making use of limited resources, intelligence, data and in some cases machines that register the time and use of mobile phones in a smart network to confirm information.

Some entrepreneurs developed the mobile app "TuRuta"[84] with the aim to improve the quality of life in the city and enabling access to the name, route and picture of the transport; also, it gives information about traffic and localization of bus stops. While cycling is a challenge and routes are limited; the bike sharing is working in San Borja and to be implemented this year in San Isidro; there are some applications that allow the sharing of information as for routes, time, and education about repairing bicycles up to ask for help in case of an accident.

In the last decade, there are initiatives

METRO LINE
Source: http://www.lineauno.pe
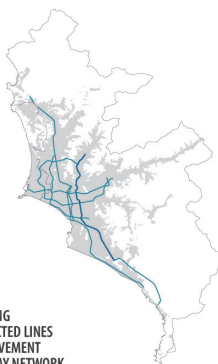
1
LINE

METRO DE LIMA Y CALLAO:

BEGAN OPERATION IN 2011 - RENEWAL.
IT CONNECTS FROM NORTH TO SOUTH.
35 KM LENGHT.

26
STATIONS

SUSTAINABILITY:

REDUCCION OF NOISE.
REDUCTION OF POLLUTION.
EFFICIENCY.
POWERED BY OVERHEAD ELECTRIC LINE

EXISTING
PROJECTED LINES
IMPROVEMENT
RAILWAY NETWORK

https://assets.trome.pe/

hhttp://portal.andina.pe/

BUS RAPID TRANSIT
Source: http://www.metropolitano.com.pe
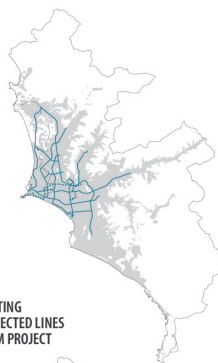
1
LINE

METROPOLITANO:

BEGAN OPERATION IN 2010.
IT CONNECTS FROM NORTH TO SOUTH.
33 KM LENGHT.

38
STATIONS

SUSTAINABILITY:

REDUCCION OF NOISE.
REDUCTION OF POLLUTION.
EFFICIENCY.
POWERED BY NATURAL GAS

EXISTING
PROJECTED LINES
TRAM PROJECT

https://fthmb.tqn.com/

https://postimg.org/

BYCICLE
Source: PLAM 2035.

4.1
KM
AVERAGE TRIP

BIKE SHARING:

SAN BORJA EN BICI. SAN BORJA DISTRICT SINCE 2012.
SMOOVE. TO BE IMPLEMENTED IN 2018 IN SAN ISIDRO.
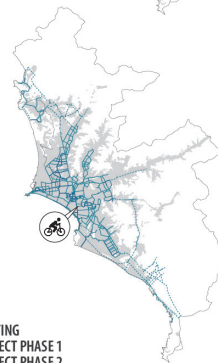
1
SHARING

SYSTEM IMPLEMENTED
IN MUNICIPALITIES

POLICIES:

CLOSURE OF AREQUIPA AVENUE (7 KM) ALL SUNDAYS
FROM 07:00 TO 13:00 HRS.

CHAPA TU BICI. PROMOTION OF THE USE OF BYCICLE,
SPECIALLY EVERY 22ND OF MONTH. IN SAN ISIDRO.

EXISTING
PROJECT PHASE 1
PROJECT PHASE 2

https://img.elcomercio.pe/


https://cde.publimetro.e3.pe/

Figure 47. Mobility in Lima.

towards the reform of the transport system and the promotion new urban facilities, more efficient and sustainable service through the Integrated Transport System; it comprehends the provision of a Bus Rapid Transit network and Metro; as well as the scrapping of old vehicles and the change of the energy matrix of diesel and oil to natural gas vehicle – NGV. With the collaboration of the GEF[85] the implementation of the Metropolitano a BRT public transport network was made possible. It has a total length of 29.40 km and helps to connect the north-south artery and passing by the historic city centre, serving to 3.5 million people (Global Environment Facility, 2015); including effective public awareness and building capacity for an efficient, cleaner and safer system[86]. The project was a driver of a complex process of modernization and improve connectivity of the city, accelerating the regeneration of some dismissed areas and renovating some iconic buildings as the "Centro Civico" and turning it into a commercial centre and locating the central station of the Metropolitano[87].

Together with the Metro of Lima, the network connects from North to South the city and represents divided systems but in a future will be part of an integrated system. A respond to the need of public transport was the privatization of routes, buses and microbuses, taxis and the use of auto rickshaw as alternatives for small trips. Today the formalization of some of them has a result the consolidation of urban corridors[88] with blue buses, an initiative from the metropolitan municipality with the aim of improving the mobility in the city centre and the pilot projects are on the principal avenues like Javier Prado – La Marina – Faucett connecting from west and east and Tacna – Garcilazo – Arequipa connecting from north to south.

Regarding the taxis and semiprivate transportation, there are several businesses that through mobile apps offer the service and security warranty to people (Cuevas et al., 2017); while the opportunity also extends to autorickshaw which is common in areas with difficult access in the peripheric areas of the metropolis, so for example "EasyKar"[89], nevertheless it can improve the mobility there are many issues related to the security and prevention of accidents. On the other extreme of use of technologies there are some ideas as the implementation of smart stops because they are still a problem, in the sense that buses and citizens are still in the transition of respecting the bus stops, without personal experience or "dateros" cannot calculate them journey, the infrastructure is reduced or to a post with a signal, if there is a stop with bench it has low

Map 15. Mobility network in Lima.
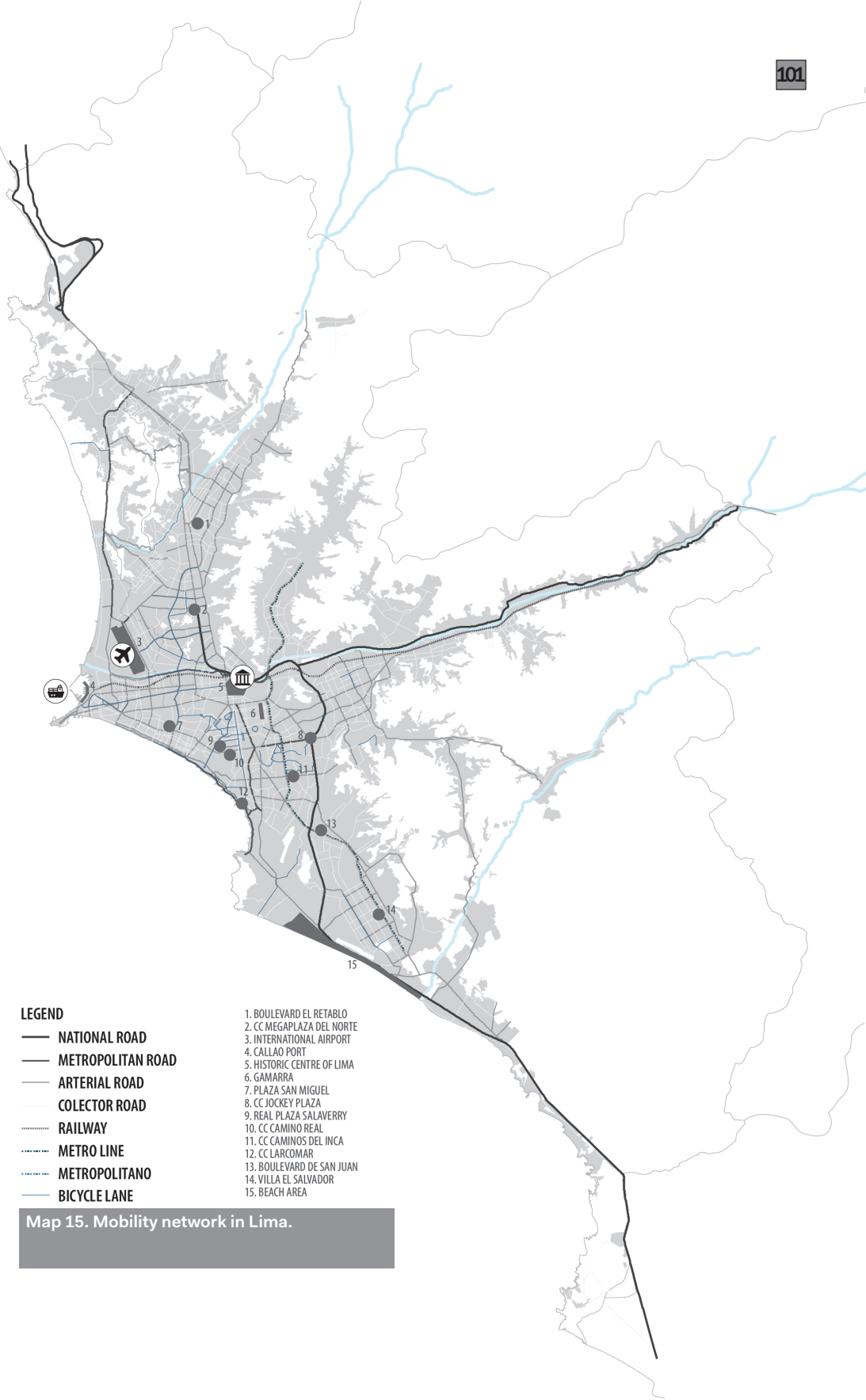
LEGEND

— NATIONAL ROAD
— METROPOLITAN ROAD
— ARTERIAL ROAD
— COLECTOR ROAD
······ RAILWAY
·—·—· METRO LINE
·—·—· METROPOLITANO
— BICYCLE LANE

1. BOULEVARD EL RETABLO
2. CC MEGAPLAZA DEL NORTE
3. INTERNATIONAL AIRPORT
4. CALLAO PORT
5. HISTORIC CENTRE OF LIMA
6. GAMARRA
7. PLAZA SAN MIGUEL
8. CC JOCKEY PLAZA
9. REAL PLAZA SALAVERRY
10. CC CAMINO REAL
11. CC CAMINOS DEL INCA
12. CC LARCOMAR
13. BOULEVARD DE SAN JUAN
14. VILLA EL SALVADOR
15. BEACH AREA

Figure 48. "Datero" in Lima.

Figure 49. Mobile app for information of transport in Lima.

maintenance and even waiting them for more than ten minutes represents a risk to suffer robbery. So, the awareness and search of new solution produces events and contests[90] as the one promoted by the Organization of the American States – OAS, the local government and the academia, that brought the proposal of a "Smart Bus stop network"[91] an interconnected system through wi-fi of modular and flexible stops that well as a three-sided display module with a radio-frequency identification system to record the buses, a LED screen that provides information and allows to make an schedule of buses, USB charging ports and QR codes with daily news, books and tourist information. The problem in this initiative is the replicability and financing in all the city, otherwise implementing this system only in the inner centre of the city will only accentuate the social gaps. So the changes in the mobility system need to give significance to the pedestrian, in a culture of respect, transforming public transport into an efficient and quality service (Ando Despacio 2008), but it also involves improving the existing infrastructure as the maintenance of roads and pedestrian paths and in some cases the construction of them in dismissed areas and new urban settlements (Municipalidad Metropolitana de Lima, 2015). In any case, it represents an important element of social inclusion.

SMART ECONOMY

In the same perspective, there are networks of production both in horizontal level, thus chains of production that improve their communication through ICT and maximize, for example the effectiveness of retail areas with warehouses, or the vertical production in one building, so the retail area is at the street level, the sale of materials and supplies are in intermediate levels, the production/manufacture area in higher levels, and because workers are concentrated there, there is also food supply. In order to improve the competitiveness level of the city, some initiatives by the local government are the implementation of efficient logistics system; to eliminate the bureaucratic to start a business that will also contribute to the formalization of them; the local government takes as a model the digitalization of the city and consecutive transition towards the smart city (Metropolitan Institute of Planification, 2015). Furthermore, urban laboratories promoted by the government are focused on social innovation, as the case of the Minedu Lab, in charge of the Ministry of education, that had as a goal improve the accessibility and education access, it had as output the "Plan Selva" that with modular infrastructure, but also a change in the process and communication management between professor and the administrative education offices that can communicate with SMS in order to monitor the advances and requirements, thus improving the efficiency of the process (Saavedra Chanduvi, 2016). In addition, business-oriented labs are focusing on design thinking and human centred services.

SMART GOVERNMENT

The use of open data promotes a better communication between citizen and municipalities and aims to improve efficiency in procedures as emission and monitoring of licenses, permits and payment of taxes; but the system is not available in all districts. Nevertheless, the partnership between municipalities, industry and academy allows the organization of differents events focused on the digital education of people, the spread to new products and the promotion of development of new urban services. As a result, some mobile apps, websites and projects have emerged.

EDUCATION

COMMUNITY EDUCATION PROGRAMS
CULTURAL ACTIVITIES
ACCESS TO INFRASTRUCTURE
IMPROVE COMMUNICATION BETWEEN ADMIN

INNOVATION LAB

FOCUS ON INNOVATION IN PRACTICAL ACTIONS
TO ADDRESS COMPLEX SOCIAL CHALLENGES

SOCIAL LAB

MINEDU LAB

TARGET
IMPROVE THE EDUCATION IN THE
AMAZON

PROBLEM
1_INADECUATE INFRASTRUCTURE
2_HIGH COST OF CONSTRUCTION
DUE TO ISOLATED SCHOOL
3_DISPERESE PRIMARY AND
SECONDARY SCHOOLS

OUTPUT
PLAN SELVA

IMPACT
IMPROVE ON THE EDUCATION
_CONTEXT BASED SCHOOL
_LOW COST MODULAR SCHOOL
INFRASTRUCTURE
_A UNIQUE BIDDING FOR
CONSTRUCTION
_IMPROVE IN THE COMMUNICA-
TION BETWEEN EDUCATION
ADMIN WITH A SMS

SUPPORTED BY PUBLIC INSTITUTIONS
AIM TO SEARCH FOR SOLUTIONS TO COMPLEX
SOCIAL PROCESSES

FAB LAB

LIMA FAB LAB

TARGET
TECHNOLOGICAL DEMOCRATIZA-
TION

PROBLEM
_LIMITED ACCESS TO NEW
TECHNOLOGIES
_DIFFICULTY TO GENERATE
STARTUP

OUTPUT
A SOCIAL INNOVATION HUB

IMPACT
_PROVIDE OF TOOLS TO SMALL
TRADERS
_PROMOTE EXPERIMENTATION
AND INNOVATION THROUGH NEW
TECHNOLOGIES
_INNOVATION IN THE INFORMAL
TRADER NETWORK

SUPPORTED BY THE MIT'S CENTRE FOR BITS
AND ATOMS - CBA
OFFER TECHNICAL SUPPORT AND
PROTOTYPING PLATFORM FOR INNOVATION

BUSINESS ORIENTED LAB

LAVICTORIALAB + IDEO

TARGET
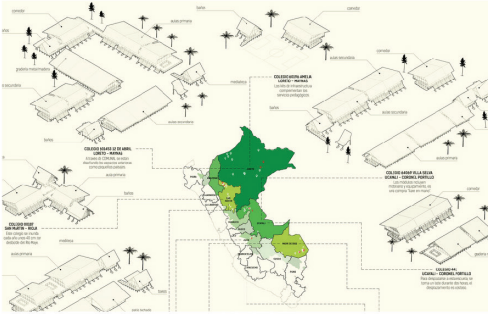OFFER AN ACCESSIBLE, SCALABLE
AND HIGH QUALITY SYSTEM OF
SCHOOLS

PROBLEM
1_INADECUATE EDUCATION
MODELS
2_HIGH COST TO ACCESS TO
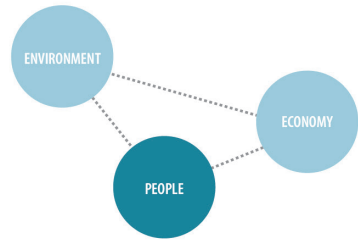EDUCATION OF QUALITY

OUTPUT
INNOVA SCHOOLS

IMPACT
_HIGH QUALITY EDUCATIONAL
MODEL COMPARABLE TO BEST
SCHOOLS IN THE WORLD
_AFFORDABLE FOR EMERGING
MIDDLE CLASS
_PROFICIENCY IN FEDERAL MATH
EXAMS ABOVE FROM THE
NATIONAL AVERAGE

SUPPORTED BY PRIVATE BUSINESS E.G.
FINANTIAL CORPORATIONS OR UNIVERSITIES
BASED ON DESIGN THINKING TO RESPOND TO
HUMAN CENTERED SERVICES

Figure 50. Innovation Labs in Lima.

SMART + SUSTAINABLE

CHANGE IN THE EDUCATION APPROACH

ENVIRONMENT

ECONOMY

PEOPLE

https://i.ytimg.com/vi/IVhn2TDYKdg/maxresdefault.jpg

CHANGE IN THE PRODUCTION CHAIN

ENVIRONMENT

ECONOMY

PEOPLE

http://revistabusiness.com.pe/files/2018/02/innova.jpg

CHANGE IN THE EDUCATION SYSTEM

ENVIRONMENT

ECONOMY

PEOPLE
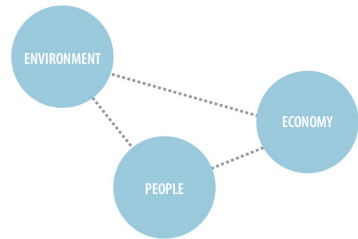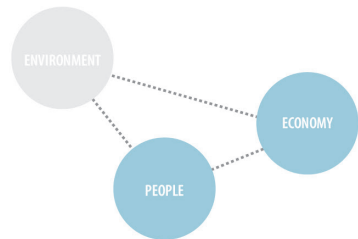
CONCLUSIONS

THE SMART CITY AS MODEL FOR URBAN SUSTAINABILITY

6. CONCLUSIONS

The smart city paradigm is grounded in particular places like mature cities and economies of the North have developed seveal networks for sharing the best practices, while in the Global South, identified as a place of social fragmentation, the smart city represent a valid tool towards sustainable urban development because it focus on the investment of the social capital, the use of technology and the efficient use of resources in order to improve the livability of the city and the quality of life of citizens. In the topic of inclusion, it promotes the exchange of knowledge to improve the living conditions of the population residing in slums and development of pro-inclusion policies. For what concerns resilience, the idea is to share some experiences to deal with risk management for urban management, including prevention, emergency attention and reconstruction. Regarding productivity, to monitor the city growth dynamics, economic and productive development; work on innovation to finance mechanisms for urban policies. And on the topic of infrastructure and connectivity, it promote the development of infrastructure for the construction of intelligent cities focused on the municipal administration, services, mobility and transportation, public safety, as well as education and health.

Although the transfer of the model must be examined and adapted to the context, respecting the three elements for sustainability is key; that means to respect the society related to the cultural diversity and being aware of the institutions, the levels of inequities and democracy; the environment both natural and constructed due to the fragility of the ecosystem, the geography and climate, the levels of urbanization and the social needs and the economy as the level of productivity and competitiveness of the city, such as the problems and opportunities for financing. In that sense, it is important to establish the difference in the target in urban management in developed countries and developed countries as a starting point so the concept and approach of the smart city should take into account the context in order to tackle in an effective way the problems of urbanisation, but if on the contrary, the smart city project implementation is context indifferent there is a risk of reinforcing those inequalities that them said to deal, due to the divisions generated from having or not certain technologies and that determine new forms of exclusion (Shelton, Zook, & Wiig, 2015; Vanolo, 2016).

After the first scanning of the smart cities initiatives the most promising region to study is Latin America and the Caribbean which shares internally some similarities

in terms of geography, vast territories with concentration of population in the main cities, some of them fits in the category of megacities; regarding the society, there is a high level of social inequity and democracy presents in general a flawed level with exception of Cuba and Venezuela (see map 19 in appendix); that allows to understand the differences with the urban management goals within developed and developing countries, at least in terms of a general approach for analysis with different perspective and methodologically to find the context-based innovations. But even so, sustainability means dealing with specific problems and urban goals must be examined at different levels and scales and be part of the national, regional and local agenda.

In the second mapping is possible to identify those specific differences in the approach of smartness in Latin America and the Caribbean, so there are presented innovations that first, surge from the understanding of the territory and society and second, due to the limited resources and financing problems, are simple technologically-wise but with effective impact in reaching sustainability. Therefore, characteristics of the smart dimensions have considered different indicators. In the case of smart living the contrast with high technology smart housing and systems controlled
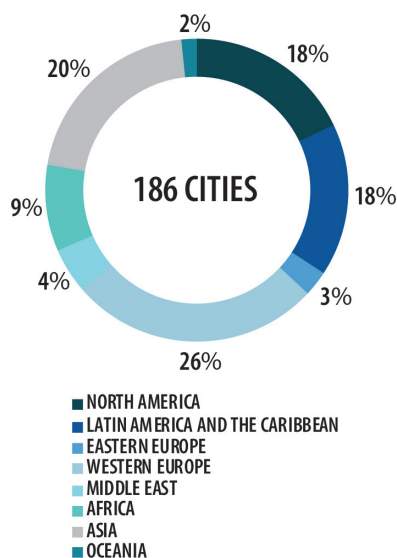
Figure 51. First scanning of smart cities.

186 CITIES

- 2%
- 18%
- 18%
- 3%
- 26%
- 4%
- 9%
- 20%

NORTH AMERICA
LATIN AMERICA AND THE CARIBBEAN
EASTERN EUROPE
WESTERN EUROPE
MIDDLE EAST
AFRICA
ASIA
OCEANIA
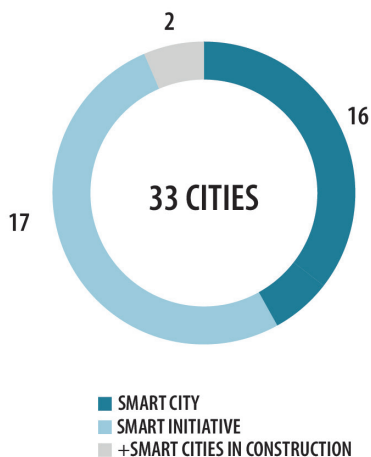
Figure 52. Smart city in Latin America and the Caribbean.

33 CITIES

- 2
- 16
- 17

SMART CITY
SMART INITIATIVE
+SMART CITIES IN CONSTRUCTION

by sensors is definitely out of place in developing countries that have to struggle with housing access in terms of quantity, due to the big urban pressure, the limits of the physical space of the city and in terms of quality because both informal settlements, densification of the city and new formal urbanization bring altogether a critical state in urban services provision and affect the quality of life. So, strategies need a change of approach and, as a result, there are solutions that consider the citizen as part of the system and as a central actor of the smart system; from collaborative mapping, community security networks and investing in prevention and educational programs; the provision of new cultural activities, infrastructure and their integration with public spaces, basically the right to the city. For example, intervention in slums is related to proper housing granting subsidies to families for the purchase, construction, expansion or improvement of a house; prevention of risk in urban settlements like geological and water risks with the implementation of infrastructure construction (Magat, 2015). In order to improve health levels it is important to increase the coverage of the service but ICT is also a tool to prevent, educate and monitor where the infrastructure is limited available (5G Americas, 2016).

In the case of smart environment some initiatives work according to the geography of the city, as the generation of electricity with solar panels, or more cultural related as the social impact of sports that generates kinetic energy. Water, waste and risk management do not fully work with sensor networks and the difference in the demand and provision in the service is still an issue, but ICT allows better communication and the approach is in changing the behaviour of people towards resilience and sustainability; as in the case of risk management the monitoring is done by the government but also the shift into prevention culture; in the case of waste a better dialog between citizen and recycling collection points, waste collectors and recycling business. Moreover, smart people means social inclusion, and access to proper education and today, digital inclusion is important in an interconnected world. Therefore instead of ICT infrastructure that is basic in other realities, initiatives in the developing south are focused on improving the coverage, quality and access to the service; in some cases, related to the recuperation of public spaces improving the quality of life and security, and internet access in educational centres.

It is important also to understand the link between innovation and inclusion as the inner synergies in cities are able to produce frugal solutions for smartness,

so the case of Lima in Perú is presented as it represents an example of cultural diversity, urban challenges, full of informal but also smart networks.

The urbanization process in Lima city occasioned both consolidated and unconsolidated settlements that affirm the social inequalities and distribution of urban services (Instituto Metropolitano De Planificacion, 2014). Therefore, there are consolidated areas and people live in average and good quality buildings with access to water and sewage facilities as the residential areas in Miraflores, San Isidro, La Molina, Jesus Maria, Surco, Pueblo Libre, San Miguel, Los Olivos; in the other extreme, people live in very poor conditions, with mat huts and deprived from basic services, water, electric energy and latrines; those areas are still spread in slums in Comas, Carabayllo, San Juan de Lurigancho, Villa El Salvador, Villa Maria del Triunfo and San Juan de Miraflores. And it is exactly that kind of invisibility that made people adopt creative solutions in order to tackle with daily problems, creating collective networks and inner synergies able to produce frugal solutions and low technological solutions that represent valuable urban innovations and that should be taken into consideration by the academy[92], the government and the industry.

Finally, the smart city doesn't depend only on the constructed infrastructure but also on the knowledge and social networks. Due to that the city configures and extends on the digital space, it changes and defines new forms of organization in the physical space and the functioning of the city; in which simultaneity prevails over the proximity; urban space continues to be a complex combination of places and network where physical and virtual experience combine. This update of urban settlements related to flows transforms the social and economic relations, that requires a systematic vision and organic management of the information, thus an organized and integrated network able to connect people and systems. In that sense, the smart city puts the technology to the civil service and enhances the cultural, socio-economic, physical and environmental capital of the city, changing the focus to the management and decisional process in real time; therefore improving the participation of the citizen (Costantino, 2015). Although the focus in innovation has changed from the previous model (Hollands, 2008) the access to ICT is an advance towards digital inclusion and that should be included in the national digital agenda. But technology alone doesn't ensure the smartness of the city is important to invest in the social capital; so, researchers and professionals started to

take collective advantage of the people experience, due to that citizens are also producers of knowledge, practical and contextual, it constitutes a way to achieve smartness and consequently, urban sustainability. In fact, for a city to become a smart city, it requires the persistence and long-term vision of itself, and strategies of the collaboration of the public, private and citizen capital working all together in a complex process (Bouskela et al., 2016; Campbell, 2012). Similarly, the investment in experience exchange with other cities that have begun implementation is fundamental to learn from others and create sharing networks; but being aware of the possibilities and limitations of the scale-up of the projects, because a solution in a specific neighbourhood cannot be the answer of an entire city. In Latin America and the Caribbean, the problem lies with the fact that most of the initiatives of the smart cities are being pushed by the government and technologic suppliers; as the lack of founds is pushing the local authorities to create agreements with transnational business and others that can ensure them better management of resources; which is totally valid but then the industry shares some of the smart solutions to the ones that are able to pay, it means the inner city, the business districts and where the ground is "ready" to give the next step; thus, cities are seen as clients, and eventually accentuating the idea that smart cities are internally differentiated and what it means for a city to be smart won't be equal in the same territory which implies the privilege some places, people and activities over others (Shelton, Zook, and Wiig, 2015); the smartest city will represent the most liveable and just city (Gaffney & Robertson, 2016).

LIMITATIONS OF THE STUDY AND FURTHER RESEARCH

This paper did not cover all the aspects of the smart city, due to the diffused information that doesn't consider the small contribution of smartness produced in Latin America and the Caribbean; rather the work is focused on demonstrating that smartness is a tool for sustainability, but it is necessary to consider the collective intelligence and context-based smart solutions that are related to the urban management goals of developing countries. Likewise, regional analysis on Latin America and the Caribbean are subject to different understanding by institutions; i.e. that in some rankings and reports as the one presented from the United Nations or World Bank in terms of indicators related to smart city and sustainability, not all the countries are considered, for example the Caribbean countries are taken as a generic group, or not all the cities area considered in report, only the capitals of countries.

7. NOTES

[1] Source: http://unfccc.int/secretariat/momentum_for_change/items/8306.php

[2] Source: https://www.planning.org/ontheradar/smartcities/

[3] A small office that offers customised services for digital fabrication; a technical prototyping platform for learning and innovation that can promote local entrepreneurship. It is able to connect a global community of knowledge sharing network. Source: https://www.fablabs.io

[4] A technological movement in which a series of physical devices are connected directly to the Internet, generating new sources of information and data; it provides autonomy and real-time solutions; offering advantages on marketing and security, for example. In Latin America, the wave will reach 100 million devices and has an expected annual growth rate of 21%. Source: https://www.bbva.com/en/can-internet-things-latin-america/

[5] Database that has three characteristics: volume (huge quantities of datasets that cannot be managed with traditional databases); velocity (data that flow and need to be processed at a sustained rhythm or in real time) and variety (data of diverse nature and non-structured as text, audio, video, cell phone, sensors, commercial transactions.

[6] Source: http://www.un.org/sustainabledevelopment/blog/2017/10/sdg-media-zone-smart-cities/

[7] An area surrounding an urban conurbation which for the various services depends on the central city and is characterized by the integration of the functions and the intensity of the relationships that occur within it, in relation to economic activities, services essential to social life, as well as to relations cultural heritage and territorial characteristics (Silvestrini et al., 2015).

[8] Source: https://www.fastcodesign.com/1680538/what-exactly-is-a-smart-city

[9] Source:http://www.eurosolaritalia.org/documenti/Roberto%20Pagani%20_%20SMART%20CITIES%20_%20Roma%20Senato%20della%20Repubblica%20_%205%20Giugno%202012.pdf

[10] Source: Source: (Programa de las Naciones Unidas para los Asentamientos Humanos, 2015)

[11] Source: http://smartcities.gov.in/content/innerpage/what-is-smart-city.php

[12] Source: http://www.latinamerica.undp.org/content/rblac/en/home/regioninfo/

[13] Island and unincorporated territory of the USA

[14] Archipelagic state

[15] Source: http://www.un.org/sustainabledevelopment/sustainablecities/

[16] Source: http://smartcities.gov.in/content/

[17] Source: https://www.youtube.com/watch?v=8mDwoPMisIA

[18] A high number of smart initiatives are located in those countries, each one adopting different strategies.

[19] Cities in the developing south have and average democratic system but it doesn't mean political stability, there are huge issues in terms of corruption and freedom.

[20] The Cities in Motion Index – CIMI assesses cities with the evaluation and comparative analysis of 10 dimensions such as the economy, technology, international outreach environment, urban planning, mobility and transportation, human capital, social cohesion, governance and public management.

[21] For example, the "Inclusive, Productive and Resilient Cities Conference" reunites different authorities and organizations enhancing into the development of the region.

[22] Creating a network where cities can improve inclusiveness, productivity and resilience; while focusing on five pillars of action: fairness and social inclusion, comprehensive risk management and resilience, productivity, infrastructure and connectivity, funding.

[23] Source: https://www.caf.com/en/currently/events/2017/11/caf-conference-cities-with-a-future/

[24] The approach is multidisciplinary, transversal founded on the environmental sustainability and climate change sustainability, urban sustainability, and economic sustainability and governance.

[25] A platform with a database that allows the comparison of around 150 quantitative indicators that provides interactive maps and enables the public discussion of intermediate cities which have an outstanding position in terms of economic and population growth which are part of the ESC.

[26] Source: http://www.urbandashboard.org/iadb/index.html

[27] Source: https://www.thegef.org/about-us

[28] Source: https://unfccc.int/climatefinance?gefhome

[29] With the aim to integrate models of sustainable urban design, planning and implementation, fostering partnership and collaboration between cities and agencies, on strengthening towards urban sustainability and forging a shared vision.

[30] Based on three pillars: planning (using spatial data, indicators, integrated planning), finance (municipal financing, investment alternatives, project preparation) and connection (intercity learning, a partnership with networks, collaboration with financial institutions) of cities as part of the urban sustainability framework.

[31] Source: http://www.bnamericas.com/en/news/technology/smart-cities-the-next-step-for-latin-america

[32] Source: http://www.smartcityexpo.com/en/the-event

[33] Source: http://www.intelligentcommunity.org/smart21

[34] In Brazil cities as Rio de Janeiro (2015, 2014, 2013), Curitiba (2012, 2011), Porto Alegre (2010, 2009), Pirai (2005); Durango and Tuxtla Gutierrez in Mexico (2012) and Barceloneta in Puerto Rico (2008)

[35] Source: https://www.gold.ac.uk/news/comment-smart-slums-utopian-or-dystopian-vision-of-the-future/

[36] Source: http://www.techo.org/paises/us/informate/techo-promises-habitat-iii-map-of-slums-in-8-latin-american-countries/

[37] Source: https://www.caminosdelavilla.org

[38] Source: http://www.municipalidaddesantiago.cl/sosafe/

[39] Source: http://www.govtech.com/dc/articles/Vigilante-Taxi-Drivers-Save-Lives-With-Mobile-Phones-GPS-and-Web.html

[40] Source: https://www.intelligentcommunity.org/tuxtla_gutierrez_chiapas

[41] Source: http://www.elpais.com.co/tecnologia/adenunciar-la-plataforma-virtual-para-denunciar-delitos-en-15-minutos.html

[42] Source: http://rio.unicef-gis.org

[43] The program is managed by the State Health Foundation - Funesa in collaboration with State Health Secretariat - SES and Unified Health System - SUS.

[44] The economic model of Chile is one of the most stable and it ranks 33 in the Global Competitiveness index made in 2017 in contrast with other 137 economies.

[45] The social program for access to housing 'Minha Casa, Minha Vida' target families with incomes of up to 1.5 minimum wages, approx. 432 dollars.

[46] Source: https://www.theguardian.com/global-development-professionals-network/2014/nov/28/honduran-slums-solar-rights-dwellers-upgrading-development

[47] Supported by the clean energy company Pavegen that named the product Astroturf Source: https://www.joiscientific.com/innovations-in-distributed-power-change-lives-inside-megacities/

[48] Source: https://thenassauguardian.com/2018/02/02/implementation-of-idbs-sustainable-nassau-action-plan-could-cost-450-mil/

[49] Aiming efforts for climate resilience it has a recognition in the ranking of the regional Green Cities held by Siemens Source: https://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_latam_en.pdf

[50] Source: http://www.recypuntos.org

[51] Source: http://breakthrough.unglobalcompact.org/briefs/wealth-in-brazils-waste-new-hope-ecotech-luciana-oliveira/

[52] The country has two official languages Spanish and Guaraní.

[53] Source: https://subscriber.bnamericas.com/en/news/colombia-argentina-peru-paraguay-pick-up-latam-smart-city-prizes1?position=1&aut=true&idioma=en

[54] It has reached the label of "Greener, smarter and more inclusive society"

[55] Source: https://www.theguardian.com/world/2013/jul/31/medellin-colombia-fast-track-slums-escalators

[56] Source: http://country.eiu.com/article.aspx?articleid=1356389719&Country=Venezuela&topic=Politics

[57] Source: http://cop20.minam.gob.pe/29410/que-logro-el-peru-en-su-participacion-en-la-cop21/

[58] Source: https://www.indeci.gob.pe/contenido.php?item=MTgz

[59] Source: https://www.wearefactor.com/en/sustainable-building-code-in-peru/project/7

[60] Source: http://cop20.minam.gob.pe/en/25453/peru-aprueba-el-codigo-de-construccion-sostenible-para-luchar-contra-el-cambio-climatico-y-tener-ciudades-sostenibles/

[61] Source: https://www.finchannel.com/business/44925-ifc-supports-green-building-code-in-peru-to-promote-sustainable-construction

[62] Source: https://www.slideshare.net/ayhelen/la-agenda-digital-2-36845595

[63] Source: http://www.pqs.pe/economia/peru-paises-mas-emprendedores-del-mundo

[64] Source: https://www.produce.gob.pe/index.php/innovate-startup

[65] Source: http://www.start-up.pe/acerca.html

[66] While these urban forms can bring administrative and economic advantages, they can also broaden advantages from the administrative and economic point of view, they can also increase the social inequalities, causing social segregation and challenge the governance.

[67] According to the proposal presented by the Lima (Lima Cómo Vamos Observatorio Ciudadano, 2017) the conurbanization of the metropolis conformed by the Constitutional Province of Callao and the Province of Lima, should be considered for purposes of governability. And the process is based on the consolidation of a geographic, social and economic unit in order to benefit and reorganize its functionality.

[68] The districts with higher growth have located the edges of the city such as Ventanilla and Pachacamac, characterised by a youth population. In the other hand, there are nine districts have lost population during the last period such as Barranco, Breña, Cercado de Lima, La Victoria, Lince, Miraflores, Rimac, San Isidro and La Punta, which conforms Lima Centre, due to the displacement of housing land use by new uses related to commerce and office, and the concentration of the largest population in those areas of the city.

[69] Specifically, for the service sector, the areas of San Isidro, Miraflores and Callao concentrates important company's offices, banks, transport, software, health infrastructure, cultural centre and hotel facilities. Thus, the dynamic of the area requires the attraction of people with high education, workers have high managerial skills and salaries are above the city average; they are not linked to the local economy but in a more globalized way which is totally opposed to the informality and low quality of local employees of the city in general.

[70] It is important to mention that the Central Road represents the most important artery that allows the connection between the regions in the Amazon and the centre of the country; it arrives at the city of Lima along the Rímac river.

[71] The methodology of areas and integration of nuclei developed by the Centre for Research and Development in Information Technologies and Communications - CENTEL from Colombia include: smart environment, smart living, smart economy, smart government, smart mobility, smart people; and they are integrated into three nuclei: knowledge, physical infrastructure and ICT, and services and applications.

[72] Source: https://www.plataformaarquitectura.cl/cl/775602/arquitectura-en-comunidad-fiteca-y-la-creacion-del-barrio-cultural-de-la-balanza-en-lima

[73] Source: https://elcomercio.pe/lima/seguridad-ciudadana-tres-mil-alertas-mes-via-aplicaciones-300352

[74] Source: https://gestion.pe/tecnologia/reach-primera-red-social-peruana-pretende-luchar-delincuencia-114947

[75] Source: https://reachsos.com

[76] Green areas in the urban context can play an important role in the adaptation of the city towards sustainable development, such as the increasing of the m2 per inhabitant, regulation of the microclimate and temperature, erosion control, food security.

[77] Source: http://www.gloobal.net/iepala/gloobal/fichas/ficha.php?entidad=Experiencias&id=1569&html=1

[78] Source: https://www.plataformaarquitectura.cl/cl/760924/espacios-publicos-amables-para-una-ciudad-informal-la-experiencia-de-barrio-mio-en-lima

[79] Source: https://ocupatucalle.org

[80] Source: http://hospitaldesolidaridad.blogspot.it

[81] Source: https://elcomercio.pe/tecnologia/actualidad/jordi-marin-ciudades-smart-cities-379971

[82] Source: http://larepublica.pe/sociedad/721868-estudie-educacion-pero-soy-datero-gano-mas

[83] Source: http://www.eduardovalencia.com/2015/04/los-dateros-de-lima-los-ayunadores-los.html

[84] Source: http://turuta.pe

[85] In the area of Climate Change Mitigation, the GEF supports projects which focus in low-emission technologies and reduction of greenhouse gas emissions – GHG; thus, in Perú it supported the implementation of Sustainable Transport, the first bus rapid transit system in the capital, Lima.

[86] Source: http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/8525682E00686037852579D00063D3C9?opendocument

[87] Source: http://www.metropolitano.com.pe

[88] Source: http://www.protransporte.gob.pe/index.php/corredores-complementarios/corredores

[89] Source: http://www.capital.com.pe/actualidad/easykar-lanzan-servicio-de-mototaxis-por-aplicativo-en-lima-noticia-1109514

[90] The municipality of San Isidro in collaboration with the Scientific University of the South developed the contest Sustainable cities in 2017 with the aim to promote the urban innovation Source: https://www.cientifica.edu.pe/noticias/ciudades-sostenibles-un-nuevo-concepto-paraderos-inteligentes

[91] Source: http://blogs.upn.edu.pe/egresados/2017/09/05/paraderos-inteligentes-un-proyecto-ganador-de-nuestro-egresado-elmer-gutierrez/

[92] Thus, Fab Lab Lima was the first one implemented in South America. Source: https://makezine.com/2014/04/24/benom-juarez-on-the-future-of-digital-fabrication-in-peru

8. LIST OF FIGURES, TABLES & MAPS

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WEBSITE:

http://www.eclac.org/tic/flash/
http://mdgs.un.org/unsd/mdg/Data.aspx
http://www.atlas.d-waste.com
https://www.cesla.com/centros-de-estudios-latinoamericanos.php
http://www.connectedsmartcities.com.br/
https://unhabitat.org
http://www.fukuoka.unhabitat.org/programmes/detail04_03_en.html
http://www.smartcitysantiago.cl
https://www.inei.gob.pe/bases-de-datos/
http://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=e

THE DATA

APPENDIX

URBAN POPULATION

- 0-25 %
- 25-50 %
- 50-75 %
- 75-100 %
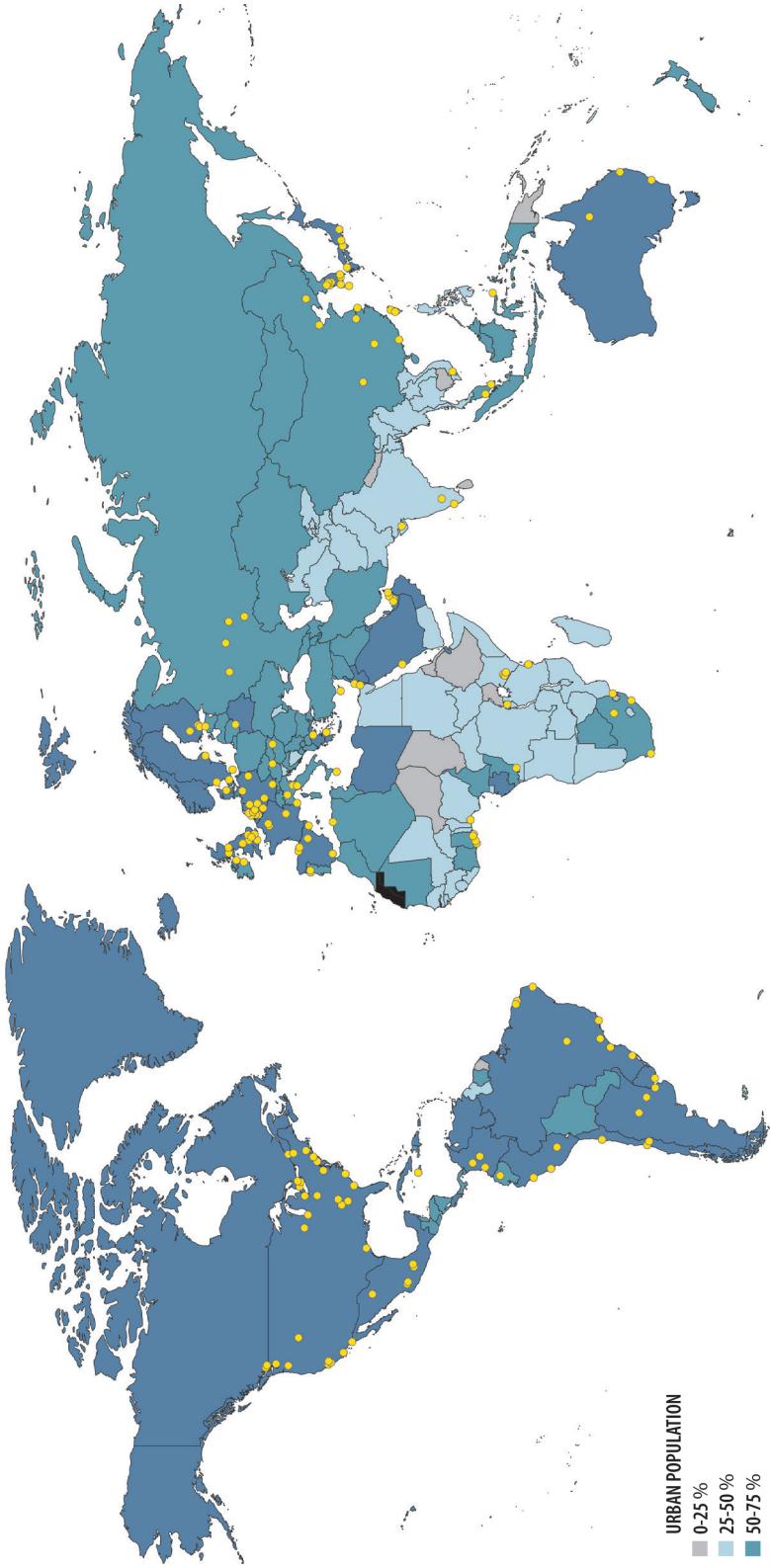
Map 16. Urban population and Smart Cities.
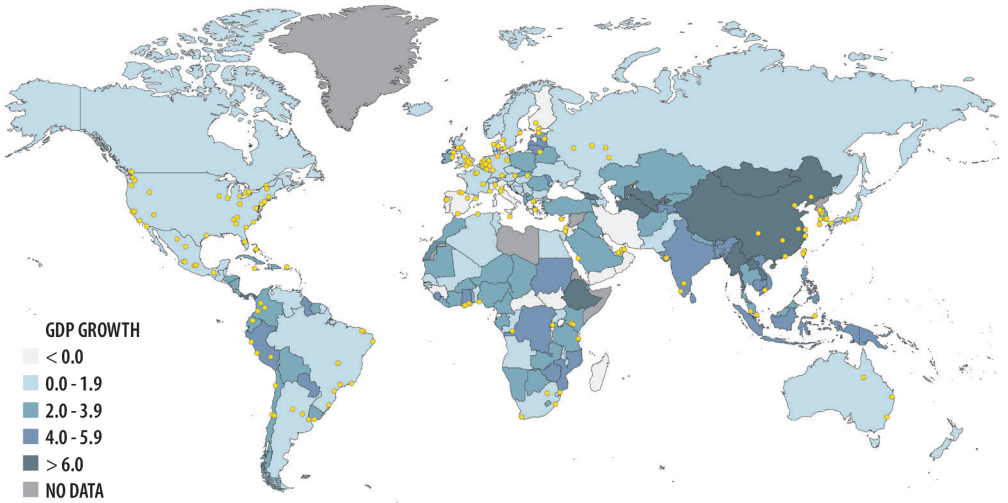
Map 17. GDP and Smart Cities.
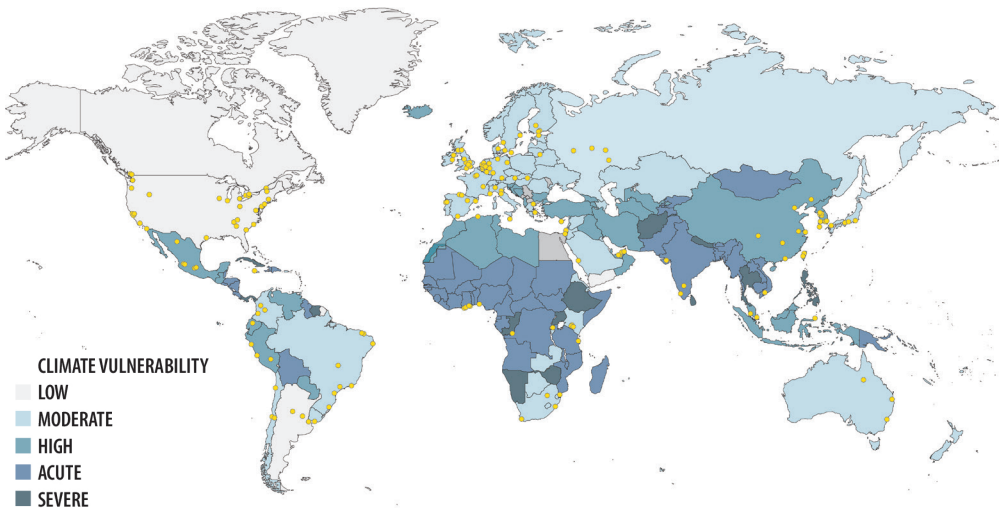
Map 18. Environmental vulnerability and Smart Cities.

Table 8. Smart cities world wide (next page).

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
1	AFRICA	ALGERIA	SIDI ABDELLAH	THE SMART CITY MASTER PLAN FOR SIDO ADBELLAH NEW CITY AIMS AT DEVELOPING A NEW URBAN SPACE SPECIALIZED ON SCIENCE AND TECHNOLOGY.	http://www.gsma.com/ connectedliving/wp-content/ uploads/2012/015/Smart-Cities_25APR2012_final_Printed.pdf
2		CONGO	KINSHASA	KINSHASA HAS URBAN RENEWAL PROJECTS THAT PROMISE TO BRING "MODERNIZATION" AND MAKE KINSHASA A "MODEL FOR THE REST OF AFRICA".	
3		GHANA	APPOLONIA	APPOLONIA - CITY OF LIGHT IS A PLAN TO BUILD A NEW URBAN AREA FOR HOUSING, RETAIL, LOGISTICS AND MANUFACTURING, WITHIN A PLAN FRAMEWORK DESIGNED TO MEET THE SPECIFIC NEEDS OF THE LOCAL AREA.	http://www.appolonia.com.gh/ about-us/city-of-light/
4			HOPE/ PRAM PRAM	HOPE CITY IS A NEW "TECHNOLOGY" CITY TO BE BUILT AT PRAM PRAM OUTSIDE ACCRA, IN GHANA. THE VISION OF HOPE CITY IS A CITY FILLED WITH PEOPLE WHO ARE CONNECTED AS A COMMUNITY OF BELIEVERS WITH THE PURPOSE OF LOVING GOD, LOVING PEOPLE, AND CHANGING THE WORLD.	http://yourhopecity.com/
5			KING CITY	A PLAN TO BUILD A NEW URBAN AREA IN KING CITY TO ATTRACT VISITORS TO THE OFFSHORE OIL AND GAS EXPLORATION. THE LAND WILL BE USED FOR RESIDENTIAL, LOGISTICS, LIGHT INDUSTRY AND RETAIL.	http://www.rendeavour.com/projects/king-city
6			PETRONIA	A NEW URBAN AREA THAT AIMS AT EXPLORING OIL, GAS AND MINING INDUSTRIES.	http://petroniacity.com
7		KENYA	KONZA	THE PLAN IS TO BUILD A NEW CITY DURING THE NEXT 20 YEARS. THE CITY SHOULD BE SUSTAINABLE, GREEN, A WORLD-CLASS TECHNOLOGY HUB AND A MAJOR ECONOMIC DRIVER.	http://www.konzacity.go.ke/
8			MACHAKOS	PLAN FOR A NEW CITY PROMOTED BY THE GOVERNMENT OF MACHAKOS COUNTY RATHER THAN BY NATIONAL GOVERNMENT	http://www.machakosgovernment.com/GovernmentPhotos/Machakos. aspx?PhotoID=6
9			NAIROBI	IBM LAUNCHED A WHITE PAPER TO TURN NAIROBI INTO A SMART CITY FOCUSING ON TRANSPORTATION, ENERGY AND PUBLIC SAFETY.	http://www.nairobi.go.ke/
10			TATU	THE PLAN IS TO BUILD A LARGE SCALE URBAN AREA WITH RESIDENTIAL HOUSING, COMMERCE, INDUSTRY, TOURISM, SOCIAL AND RECREATION ACTIVITIES.	http://www.tatucity.com/
11		MOZAMBIQUE	MAPUTO	THE WORLD BANK IS TRYING TO IMPROVE WASTE MANAGEMENT WITH AN INITIATIVE THAT USES CROWDSOURCING VIA MOBILE APPS TO GATHER INPUT FROM CITIZENS AND WASTE COLLECTORS ABOUT THE LOCATION OF RUBBISH IN THE CITY.	http://www.scidev.net/global/cities/ feature/developing-world-city-smart. html
12		NIGERIA	EKO ATLANTIC	EXPECTS TO BE THE NEW FINANCIAL EPICENTER OF WEST AFRICA BY THE YEAR 2020. THE VISION AIMS TO TRANSFORM LAND LOST TO THE SEA INTO CITY LAND. THE PROJECT HAS TWO MAJOR ENVIRONMENTAL GOALS, REVERSING COASTAL EROSION AND RELIEVING SOME OF THE PRESSURE ON LAND IN LAGOS.	http://www.ekoatlantic.com/
13		RWANDA	KIGALI	THE KIGALI CONCEPTUAL MASTER PLAN AIMS AT REPLACING AN EXISTING CITY FOR ONE ENTIRELY NEW WHERE DUBAI AND SINGAPORE ARE THE MAIN SOURCES OF INSPIRATION.	http://www.kigalicity.gov.rw/
14		SOUTH AFRICA	DURBAN	DURBAN HAS A LONG-TERM SMART CITY PLAN "IMAGINE DURBAN" BASED ON CREATE A SAFE CITY; PROMOTE AN ACCESSIBLE CITY; CREATE A PROSPEROUS CITY; CULTURAL DIVERSITY; ENVIRONMENTALLY SUSTAINABLE CITY; FOSTER A CARING AND EMPOWERING CITY.	http://www.imaginedurban.org/
15			JOHANNESBURG		
16			STELLENBOSCH	THE STELLENBOSCH INNOVATION DISTRICT, IN COLLABORATION WITH THE LOCAL UNIVERSITY, HAS BUILT "SMART SHACKS." THE PROJECT IS USING ALTERNATIVE ENERGY AND MOBILE TECHNOLOGY TO ADDRESS THE NEEDS OF THE PEOPLE LIVING IN THE SHACKS.	http://www.stellenbosch.gov.za/
17	ASIA	TANZANIA	KIGAMBONI	KIGAMBONI CITY HAS A PLAN TO BUILD AN ECO-CITY THAT WILL RELIEVE DAR ES SALAAM OF CONGESTION AND LAND SHORTAGES.	http://kigamboninewcity.com/master-plans
18		CHINA	CHANGSHA	DIGITAL CHANGSHA SMART CITY FOCUS ON PEDESTRIAN PLANNING, CLUSTER ZONING AND GARDEN INTEGRATION, ALL ARE PART OF THE SMART CITY VISION.	http://en.changsha.gov.cn/news/ Local/2014/14/t2014014/20_558826.html
19			CHENGDU		
20			DONGTAN	THE ECO-CITY OF DONGTAN ENVISIONS A SUSTAINABLE DESIGN AND URBAN PLANNING, INCLUDING AN ENTIRELY SELF-SUFFICIENT ENERGY SYSTEM.	http://www.dac.dk/en/dac-cities/ sustainable-cities/all-cases/energy/ dongtan-the-worlds-first-large-scale- eco-city/
21			HONG KONG	WISE CITY INITIATIVE AIMS TO RETAIN PEOPLE AND THEIR TALENT IN THE CITY BY INTRODUCING INNOVATIVE AND CREATIVE TECHNOLOGICAL SOLUTIONS, AS WELL AS, TO BECOME A SMART CITY WITH HIGH LEVEL OF QUALITY OF LIFE.	http://www.wisecity.hk/ project
22			NANJING		
23			NINGBO		https://www.smart-eco-cities.org/?tag=ningbo

REF	REGION	COUNTRY	CITY	SMART INNITIATIVE	SOURCE
24	ASIA	CHINA	SHENYANG		
25			TAICHUNG, TAIWAN	TAICHUNG CITY IS CONSIDERED ONE OF THE MOST INTELLIGENT CITIES OF CHINA, BASED ON THE CITY EXTENSIVE WIMAX WIRELESS AND FIBER BROADBAND COVERAGE.	http://taiwantoday.tw/ct.asp?xItem=185710S&ctNode=421
26			TASHU	AN EXAMPLE OF SMART MOBILITY, THE TASHU SYSTEM IS A CITYWIDE PUBLIC BICYCLE RENTAL SYSTEM MANAGED USING WIRELESS NETWORK TECHNOLOGIES.	
27			TIANJIN	TIANJIN ECO-CITY IS A FLAGSHIP PROJECT BETWEEN SINGAPORE AND CHINA TO BUILD A SMART CITY WITH SUSTAINABLE DEVELOPMENT. THE VISION IS A CITY WHERE PEOPLE LIVE IN SOCIAL, ECONOMIC AND ENVIRONMENTAL HARMONY.	http://www.tianjinecocity.gov.sg/
28		INDIA	BANGALORE	BANGALORE IS DEVELOPING IN COLLABORATION WITH CISCO A PILOT PROJECT TO PROVIDE SMART PARKING, SMART CCTV SURVEILLANCE, SMART STREET LIGHTING, SMART WATER MANAGEMENT AND COMMUNITY MESSAGING.	http://indiansmartcities.in/site/index.aspx
29			GUJARAT	GUJARAT INTERNATIONAL FINANCE TEC-CITY (GIFT) INTENDS TO BE MAJOR FINANCIAL CENTER OF INDIA BY PROVIDING INTEGRATED TOWNSHIPS, A SPECIAL ECONOMIC ZONE AND AN INTERNATIONAL AIRPORT.	http://www.ibtimes.co.uk/indias-first-smart-city-takes-shape-western-state-gujarat-1496554
30			KOCHI	SMART CITY KOCHI IS ONE OF THE FIRST TWO PROJECTS TO CONSTRUCT A LARGE NETWORK OF KNOWLEDGE-BASED INDUSTRY TOWNSHIPS ACROSS THE WORLD.	http://www.ksudp.org/index.php/smart-cities-in-kerala/kochi-smart-city-proposal
31		INDONESIA	MANADO		
32		JAPAN	KEIHANNA	KYOTO KEIHANNA DISTRICT. THE CITY SMART PROJECT GOAL IS TO DEVELOP AN ENERGY MANAGEMENT SYSTEM ABLE TO MINIMIZE CARBON EMISSIONS	http://jscp.nepc.or.jp/en/keihanna/index.shtml
33			KITAKYUSHU	THE KITAKYUSHU SMART COMMUNITY PROJECT SEEKS FOR CREATING APPROPRIATE INFRASTRUCTURES FOR LOW-CARBON EMISSIONS BY INNOVATING LIFESTYLES, BUSINESS STYLES, AND URBAN PLANNING STYLES.	http://jscp.nepc.or.jp/en/kitakyushu/
34			TOYOTA	THE TOYOTA CITY LOW-CARBON SOCIETY VERIFICATION PROJECT (SMART MELIT) AIMS INTRODUCING RENEWABLE ENERGY IN HOUSES TO REDUCE CARBON EMISSIONS.	http://www.globalsmartgridfederation.org/2014/05/28/japans-approaches-to-smart-grid-and-smart-community-deployment/
35			YOKOHAMA	THE YOKOHAMA SMART CITY PROJECT GOAL IS TO TRANSFORM THE CITY INFRASTRUCTURES INTO A LOW- CARBON PRODUCTION WHILE MAINTAINING THE COMFORT OF ITS RESIDENTS.	http://jscp.nepc.or.jp/en/yokohama/
36		MALAYSIA	CYBERJAYA	MALAYSIA IS BUILDING A FUTURE INTELLIGENT CITY NAMED CYBERJAYA. THE CITY DREAM ENCOMPASSES CONSTRUCTING WORKING AND LIVING SPACES FOR ICT PROFESSIONALS AND EXPERTS FROM ALL OVER THE WORLD.	http://cyberview.com.my/industry/smartcity
37			NUSAJAYA	NUSAJAYA WANTS TO BE A WORLD CLASS BENCHMARK IN SMART CITY DESIGN, IMPLEMENTATION AND OPERATIONS.	http://www.nusajayacity.com/strategic/str.html
38		RUSSIA	KAZAN	KAZAN E-GOVERNMENT PROGRAM PROVIDES ALL NECESSARY SERVICES INCLUDING ALL THAT MAKE EASIER CITIZENS' ACCESS TO THE STATE SERVICES.	
39			NIZHNIY NOVGOROD	NIZHNIY IS DEVELOPING SMART CITY INITIATIVES, SUCH AS SMART ROADS, CROSSROADS, INNOVATIONS IN THE PUBLIC UTILITIES, AND USE OF ENERGY-SAVING TECHNOLOGIES.	
40			SAMARA	SAMARA AUTHORITIES ARE EFFICIENTLY EMPLOYING RESOURCES OF SOCIAL NETWORKS TO IMPROVE THEIR IMAGE AMONG THE ACTIVE NET USERS, NAMELY, THE YOUNG ONES.	
41			SKOLKOVO	THE AIM OF THE SKOLKOVO PROJECT IS TO CREATE A SMART CITY TO BE AN INTERNATIONAL INNOVATION CENTER.	http://sk.ru/city/p/smart_city.aspx
42		SINGAPORE	SINGAPORE	SINGAPORE SMART NATION PROGRAM SEEKS TO BUILD A SMART CITY WITH HIGH SPEED, PERVASIVE, INTELLIGENT AND SECURE ICT INFRASTRUCTURE, WHICH SUPPORTS ALL CITY SYSTEMS IN AN INTEGRATED WAY.	http://www.ida.gov.sg/Infocomm-Landscape/Smart-Nation-Vision
43		SOUTH KOREA	ANYANG		https://publications.iadb.org/handle/11319/7722
44			BUSAN	TO PROMOTE BUSAN CITY'S STATUS IN THE INTERNATIONAL COMMUNITY, THE CITY GOVERNMENT DEVELOPED A STRATEGIC PLAN TO BECOME A UBIQUITOUS-CITY (U-CITY).	http://english.busan.go.kr/SubPage.do?pageid=sub020504

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
45	ASIA	SOUTH KOREA	CHANGWON	THE CHANGWON CITY WON THE UNITED NATIONS AWARD OF THE BEST NEIGHBORHOOD PROJECT. IT WAS THE FIRST CITIZEN-LED LOCAL GOVERNMENT PROJECT IN SOUTH KOREA	http://unpan3.un.org/unpsa/ Public_NominationProfile2014. aspx?id=2351
46			GWANGJU	GWANGJU IMPLEMENTED A SMART POWER GRID SYSTEM.	
47			JEJU	THE SOUTH KOREAN GOVERNMENT SELECTED JEJU, IN JUNE 2009, AS THE SMART GRID TEST-BED, AND BROKE GROUND IN AUGUST 2009. TEST-BED IS THE PROOF OF A SMART GRID FOR A LOW CARBON AND A GREEN GROWTH STRATEGY.	http://www.nuritelecom.com/news/ spotlight/jeju_smart_grid.html https://publications.iadb.org/handle/11319/7724
48			NAMYANGJU		
49			PAJU	PAJU DECIDED TO ADOPT U-CITY CONCEPT. THE AREAS OF SMART SERVICES INCLUDED IN THE CONCEPT ARE: MOBILE, TRANSPORTATION, SAFETY AND SECURITY, ENVIRONMENT, HEALTHCARE, WATER MANAGEMENT, PORTAL INTEGRATED OPERATION CENTRE (IOC), AND MPLS 10G BACKBONE NETWORK INFRASTRUCTURE.	http://www.gsma.com/ connectedliving/ wp-content/ uploads/2012/05/6-Jin-Hyeak-Yang-Smart-Cities_KT_2JUN2012_Print. pdf
50			PANGYO		
51			YONGIN	YONGIN DESIGNED AND IMPLEMENTED A WATER QUALITY ASSESSMENT SYSTEM FOR MEASURING THE QUALITY AND FLOW OF A RIVER TO PREDICT WATER LEVELS AND DETECT WATER POLLUTION.	https://publications.iadb.org/handle/11319/7720
52			SEOUL	THE ITU-T TECHNOLOGY WATCH REPORT HAS CONSIDERED THE SEOUL'S IMPLEMENTATION OF ITS "SMART SEOUL 2015" PROJECT THE BEST-PRACTICE GUIDE TO THE CONSTRUCTION AND OPERATION OF A SMART CITY.	http://www.itu.int/dms_pub/itu-t/ oth/23/01/T23010000190010PDFE. pdf
53			SONGDO	IT HAS THE WORLD'S LARGEST INTEGRATED URBAN OPERATION CENTER, WHICH INCLUDES TRAFFIC SYSTEMS, DISASTER PREVENTION AND POLLUTION CONTROL.	http://www.songdo.com
54		TAIWAN	HSINCHU	THE OVERALL OBJECTIVE OF THE HSINCHU SMART CITY CONSTRUCTION VISION WILL BE ACHIEVED THROUGH THE IMPLEMENTATION OF E-GOVERNMENT, TECHNOLOGICAL COMMUNITIES, AND DIGITAL LIVING.	http://icity.hccg.gov.tw/ENGLISH/ iframe_in_construction.htm
55		VIETNAM	HO CHI MINH	IN SEPTEMBER OF 2012, THE VIETNAM GOVERNMENT LAUNCHED THE NATIONAL GREEN GROWTH STRATEGY. THE STRATEGY AIMS TO ACHIEVE A LOW CARBON EMISSIONS AND TO ENRICH NATURAL CAPITAL, THESE FACTORS WILL BE THE DRIVERS TO HAVE A SUSTAINABLE ECONOMIC DEVELOPMENT.	http://tuoitrenews.vn/ business/28473/lotte-japanese- partners-to-develop-2bn-eco-smart- city-in-vietnam
56	EASTERN EUROPE	ESTONIA	TALLINN	SMART BUSINESSES CITY THAT COMBINES RESEARCH AND TECHNOLOGY WITH THE DEVELOPMENT AND USE OF SOFTWARE.	http://www.tallinn.ee/ eng/ uudised?id=29423 http://tartturtu.ee/eng/
57			TARTU		
58		HUNGARY	MISKOLC	MISKOLC IMPLEMENTED A GEOTHERMAL HEATING SYSTEM, REDUCING 40% GAS EMISSIONS WHEN COMPARED WITH THE PREVIOUS GAS HEATING SYSTEM.	
59		LITHUANIA	VILNIUS	VILNIUS CITY MAYOR GOALS ARE KNOWLEDGE SOCIETY DEVELOPMENT, ECONOMIC DEVELOPMENT, INNOVATION DEVELOPMENT AND CITY COUNCIL EFFECTIVENESS.	
60		MALTA	KALKARA	THE PLAN IS TO TRANSFORM THE RICASOLI INDUSTRIAL STATE INTO A HIGH-TECH CENTER, MAKING IT ONE OF THE BIGGEST ECONOMIC CONCENTRATIONS IN MALTA.	http://www.malta-gozo-property. com/harlon/EN/content/64/Smart_City_Malta
61	LATIN AMERICA AND CARIBBEAN	ARGENTINA	BUENOS AIRES	BUENOS AIRES, THROUGH ITS PARTICIPATION IN THE MICROSOFT CITYNEXT INITIATIVE, IS DEVELOPING INNOVATIVE SOLUTIONS, LIKE CITY MOBILITY AND INCIDENTS REGISTRATION, TO MODERNIZE THE CITY.	http://smartcitiescouncil.com/ resources/buenos-aires-uses-it- solutions-and-programs-support+ government-citizens-youth
62			CORDOVA		
63			ROSARIO		
64		BARBADOS, THE	NASSAU	THE SUSTAINABLE NASSAU ACTION PLAN FOCUS ON: GREENING NEW PROVIDENCE, RENEWING AND CONSERVING ENERGY, IMPLEMENTING A ZERO WASTE PLAN, CREATING A HEALTHY CITY, CONNECTING NASSAU DIGITALLY, URBAN REGENERATION, SMART CITY MONITORING, URBAN PLANNING FOR SUSTAINABILITY, LOCAL GOVERNMENT AND AN EMPOWERED PEOPLE.	https://thenassauguardian.com/2018/02/02/implementation-of-idbs-sustainable-nassau-action-plan-could-cost-450-mil/
65		BRAZIL	BRASILIA		
66			CURITIBA	CURITIBA DESIGNED A MASTER PLAN FOR THE GROWTH OF THE CITY. THE PLAN INCLUDES CONNECTIVE CORRIDORS, LARGE PARKS, NEIGHBORHOOD PARKS AND SOCIAL SPACES.	http://depts.washington.edu/open2100/Resources/1_OpenSpaceSystems/Open_Space _Systems/Curitiba%20Case%20Study. pdf
67			FORTALEZA		
68			ITU		

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
	LATIN AMERICA AND CARIBBEAN	BRAZIL	LAGUNA SMART CITY, SÃO GONÇALO DO AMARANTE (CE)	THE FIRST SOCIAL SMART CITY. THE DEVELOPMENT WILL INCLUDE A TOTAL AREA OF 330 HECTARES, OF WHICH APPROXIMATELY 480 THOUSAND METERS SQUARED IS GREEN SPACE DISTRIBUTED THROUGHOUT THE CITY.	http://smartcitylaguna.com.br
69			NITERÓI, RIO DE JANEIRO		https://www.smartcitiesdive.com/ex/sustainablecitiescollective/niter-i-brazil-first-city-adopt-bus-high-level-service-bhls-system/429261/
70			PIRAI	EFFORT TO FINF FUNDING FOR "PIRAI DIGITAL CITY" WHILE PROMOTING THE PROVISION OF BROADBAN AND THE CREATION OF AN EDUCATIONAL TECHNOLOGY CENTRE.	http://www.intelligentcommunity.org/pirrai
71			PORTO ALEGRE	THE "DATA POA" PROJECT AIMS TO OPEN THE CITY DATA TO PROGRAMMERS, COMPANIES AND CITIZENS FOR THEM TO USE IT TO CREATE MOBILE APPLICATIONS AND SITES.	http://www.datapoa.com.br
72			RECIFE		
73			RIO DE JANEIRO		
74		CHILE	ANTOFAGASTA		
75			SANTIAGO		
76			SMART SANTIAGO / VALPARAISO	SANTIAGO IS THE FIRST SMART CITY PROTOTYPE OF CHILE. THE PROTOTYPE TRIES TO ACCOMMODATE ALL SMART CITY DIMENSIONS.	http://www.smartcitysantiago.cl/
77		COLOMBIA	BOGOTÁ	BOGOTÁ HAS LAUNCHED IN THE SPRING OF 2011 A PROCESS TO ENGAGE THE POPULATION OF THE CITY TO REINVENT ITSELF FOR THE DIGITAL AGE. AS A RESULT OF THIS ACTIVITY, THE PUBLIC DEVELOPED AND DELIVERED TO THE MAYORALTY CANDIDATES FIVE PROPOSALS, WHICH THEY REQUESTED TO BE INCLUDED IN THE NEW MAYOR'S AGENDA.	http://www.huffingtonpost.com/don-tapscott/the-heartbeat-of-bogota-e_b_1722247.html
78			CALI		
79			MEDELLIN	THE LARGE OUTDOOR ESCALATOR BUILT IN MEDELLIN CONNECTS THE POOR NEIGHBORHOODS TO THE PROSPEROUS CITY'S VALLEY CENTER. THE SYSTEM REDUCED THE TRAVEL TIME FROM HALF AN HOUR TO JUST 6 MINUTES.	http://cityminded.org/21113-innovative-city-of-the-year-6358
80		ECUADOR	QUITO		
81		JAMAICA	MONTEGO BAY	MONTEGO BAY WILL IMPLEMENT A PILOT PROJECT TO ESTABLISH A SMART CITY INTEGRATED OPERATING CONTROL CENTRE (OCC THAT INCLUDE: TRAFFIC SIGNAL CONTROL SYSTEM, ROUTE TAXI AND METRO BUS MANAGEMENT SYSTEM, PARKING INFORMATION SYSTEM, TRAVELER INFORMATION SYSTEM, AUTOMATED TRAFFIC ENFORCEMENT SYSTEM, CRIME PREVENTION SYSTEM AND DISASTER PREVENTION SYSTEM.	http://jamaica-gleaner.com/gleaner/20140120/western/western5.html
82		MEXICO	CHIHUAHUA	WIFI HOTSPOTS IN SCHOOLS, LIBRARIES AND PUBLIC PLACES. ALSO THE CITY HAS ALSO INVESTED IN E-GOVERNMENT SYSTEMS. A MUNICIPAL MONITORING SYSTEM PROVIDES VIDEO SURVEILLANCE, INCLUDING LICENSE PLATE RECOGNITION SOFTWARE, WHICH HAS ALREADY HAD A MEASURABLE IMPACT ON PUBLIC SAFETY.	
83			DURANGO		http://www.intelligentcommunity.org/durango_state_of_durango
84			GUADALAJARA	THE CIUDAD CREATIVA DIGITAL (CCD) PROJECT AIMS TO CREATE AN ENVIRONMENT CAPABLE OF GENERATING KNOWLEDGE, ENHANCING QUALITY OF LIFE, FOSTERING TALENT AND INNOVATIVE IDEAS THROUGH THE INTENSIVE USE OF NEW TECHNOLOGIES, IN THE GUADALAJARA CITY.	http://ccdguadalajara.com/
85			MEXICO CITY	THE DIGITAL MEXICO PROMOTES THE USE OF ICT TECHNOLOGIES AS A TOOL FOR SOCIO-ECONOMIC DEVELOPMENT.	http://www.smartcbi.org/index.php/en/smart-talk/item/968-mexico/968-mexico
86			TOLUCA		
87			TUXTLA GUTIERREZ	INVESTMENT OF INTERNET PROVISION, E-GOVERNMENT SYSTEM AND REPORTING SECURITY METRO SYSTEM.	http://www.intelligentcommunity.org/tuxtla_gutierrez_chiapas

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
88	LATIN AMERICA AND CARIBBEAN	MEXICO	ZAPOPAN		
89		PERÚ	CUSCO		
90			LIMA		
91			TRUJILLO		
92		PUERTO RICO	BARCELONETA	INVESTMENT ON TECHNOLOGY ORIENTED BUSINESSES, CONCENTRATES ONE OF THE LARGEST AND MOST IMPORTANT HUBS FOR PHARMACEUTICALS AND BIOTECHNOLOGY PROCESSES.	http://www.intelligentcommunity.org/barceloneta_puerto_rico
93		URUGUAY	MONTEVIDEO	MONTEVIDEO IS AN EXAMPLE OF OPEN DATA ECO- SYSTEM INITIATIVES. THE PUBLIC DATA PROVIDED BY MONTEVIDEO CITY ENABLES THE CREATION OF SEVERAL NEW OPEN-DATA APPLICATION INITIATIVES. ONE OF THEM WAS THE GXBUS INITIATIVE IN 2013. THE GXBUS MOBILE APPLICATION GIVES INFORMATION TO USERS ABOUT MONTEVIDEO PUBLIC TRANSPORTS.	http://www.opendataresearch.org/ sites/default/files/publications/ Opening%20Montevideo-a%20 case%20studyfinalll.pdf
94	MIDDLE EAST	ISRAEL	*HALUZA, GAZA STRIP	HALUZA IS THE FIRST SMART CITY OF ISRAEL, THE VISION IS TO HAVE A SUSTAINABLE SOCIETY AT SOCIAL AND ENVIRONMENTAL LEVELS POWERED BY SCIENCE AND TECHNOLOGY.	http://www.haluzasmartcity.org/smartcityen-welcome-welcome_to_haluza_-_isreals_first_smart_city
			TEL AVIV	TEL AVIV RECEIVED IN 2014 THE WORLD SMART CITIES AWARD AT THE SMART CITY EXPO AND WORLD CONGRESS IN BARCELONA. ISRAEL'S LARGEST CITY WAS RECOGNIZED FOR ITS INITIATIVES IN DIGITALLY CONNECTING AND ENGAGING CITIZENS WITH THE MUNICIPALITY'S ACTIVITIES.	http://www.tel-aviv.gov.il/eng/ GlobalCity/Pages/SmartCity. aspx?tm=24&sm=73
95		SAUDI ARABIA	KING ABDULLAH ECONOMIC CITY	AN URBAN MEGA-PROJECT COMPRISING A SURFACE OF 173KM2.	http://www.kaec.net
96		UNITED ARAB EMIRATES	ABU DHABI	THE PROJECT MISSION IS TO ADVANCE THE CLEAN ENERGY INDUSTRY IN ABU DHABI AND AROUND THE WORLD AND TO BE A CATALYST FOR THE ECONOMIC DIVERSIFICATION OF THE EMIRATE.	https://government.ae/en/about-the-uae/the-uae-government/smart-uae/smart-abu-dhabi
97			DUBAI	DUBAI SMART GOVERNMENT IS A PIONEERING INITIATIVE IN THE REGION TO PROVIDE GOVERNMENT ONLINE SERVICES ACROSS THE SPECTRUM OF CORPORATE AND COMMUNITY LIFE IN THE EMIRATE.	http://www.dubai.ae/en/ AboutDubai/eGovernment/Pages/ default.aspx
98			FUJAIRAH	SMART ADDRESSING SYSTEM	https://government.ae/en/about-the-uae/the-uae-government/smart-uae/smart-fujairah
99			MASDAR	MASDAR SMART CITY PROJECT IS BASICALLY A SHOWCASE PROJECT IN THE ENERGY SECTOR. MASDAR CITY INTENDS TO EXPLORE RENEWABLE ENERGY AND REDUCE THE ENVIRONMENTAL IMPACT.	http://www.masdar.ae
100		CYPRUS	NEAPOLIS	THE NEAPOLIS PROJECT IS ABOUT A WORLD-CLASS SUSTAINABLE NEW CITY OF ECO-INTELLIGENCE IMPLEMENTING THE MOST INNOVATIVE DEVELOPMENT STRATEGY AIMING AT A GREEN, SMART, AND INTELLIGENT COMMUNITY.	http://www.neapolis.com/ smart-vision.php
101		UNITED ARAB EMIRATES	SHARJAH	SMART BINS AND WIFI PROVISION	https://government.ae/en/about-the-uae/the-uae-government/smart-uae/smart-sharjah
102	NORTH AMERICA	CANADA	BURLINGTON, ONTARIO	SMART COMMUNITING MOBILITY	https://www.burlington.ca/en/services-for-you/smart-commuting.asp
103			MONTRÉAL	THE CITY CREATED THE SMART AND DIGITAL CITY OFFICE TO BECOME AN INTERNATIONALLY RECOGNIZED CITY AMONG SMART CITIES. ITS STRATEGY IS GROUNDED IN FOUR AXES: 1) COLLECT, 2) COMMUNICATE, 3) COORDINATE, AND 4) COLLABORATE.	http://ville.montreal.qc.ca/portal/ page?_pageid=B037,129210B5346_dad=portal&_schema=PORTAL
104			STRATFORD, ONTARIO		
105			SURREY, BC	SURREY CREATED A SMART SURREY STRATEGY GUIDE THAT EXPLAINS AND GUIDES HOW TECHNOLOGY AND INNOVATION CAN BE USED FOR DECISION-MAKING PROCESSES LIKE FUTURE PLANS, PROGRAMS AND INFRASTRUCTURES.	http://www.surrey.ca/city-government/15430.aspx
106			TORONTO, ON	TORONTO IS CARRYING OUT SEVERAL SMART INITIATIVES SUCH AS, THE NEW BLUE EDGE FOR WATERFRONT REVITALIZATION AND SMART COMMUTE FOR MOBILITY.	http://newblueedge.ca/nbe/portal; http://www.smartcommute.ca/toronto-central/
107			VANCOUVER	VANCOUVER IS IMPLEMENTING THE GREENEST CITY 2020 ACTION PLAN WITH THE OBJECTIVE OF BECOMING THE GREENEST CITY IN THE WORLD.	http://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx
108			WINDSOR, ESSEX, ONTARIO		

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
109	NORTH AMERICA	USA	ALAMEDA COUNTY, CALIFORNIA		
110			ALCOA, TENNESSEE		
111			ARLINGTON COUNTY, VA	THE E-GOVERNMENT MASTER PLAN IS A PARTNERSHIP WITH A VENTURE CAPITAL FIRM TO FOSTER THE CREATION OF A VIBRANT ECOSYSTEM FOR NATIONAL SECURITY TECHNOLOGIES AND AMBITIOUS REDEVELOPMENT PLAN FOR CRYSTAL CITY TO HOUSE 26,000 NEW RESIDENTS AND ATTRACT 56,000 JOBS IN THE KIND OF WALKABLE, MIXED- USE NEIGHBORHOODS.	http://arlingtonva.s3.amazonaws.com/wp-content/uploads/ sites/6/2014/01/DTS_EGovernmentMasterFullVersion.pdf
112			ATLANTA, GA	METRO ATLANTA CHAMBER (MAC) MOBILITY TASK FORCE WAS HONORED WITH A SMART CITY INITIATIVE AWARD DURING THE FIRST-EVER GSMA MOBILE 360-NORTH AMERICA CONFERENCE IN ATLANTA.	http://www.metroatlantachamber.com/news/items/2014/01/01B/gsma-honors-metro-atlanta-chamber-mobility-task-force-with-smart-city-initiative-award
113			BEAUFORT, SOUTH CAROLINA	THE BEAUFORT CASE STUDY ILLUSTRATES HOW THE DIGITAL TOWN HALL CAN BE USED TO EMBED PLACE-BASED PLANNING INFORMATION AND DESIGN CODES INTO THE TOWN'S E-GOVERNANCE STRUCTURE.	
114			BOISE, IDAHO		
115			BURLINGTON, VERMONT	SUSTAINABILITY PROGRAM STRIVES TO MAKE BURLINGTON A GREAT PLACE TO LIVE, WORK AND PLAY.	https://www.burlingtonvt.gov/Sustainability
116			CHATTANOOGA, TENNESSEE		
117			CHICAGO, IL	CHICAGO HAS A CIVIC ORGANIZATION CALLED SMART CHICAGO DEVOTED FOR IMPROVING CITIZENS' LIVES IN THE CITY THROUGH TECHNOLOGY.	http://www.smartchicagocollaborative.org/
118			DUBLIN, OHIO		
119			DUBUQUE, IOWA		
120			HOLYOKE, MASSACHUSETTS		
121			HONOLULU, HI	THE CITY OF HONOLULU AND IBM ARE TRANSFORMING HOW CITIZENS INTERACT WITH GOVERNMENT. BY PROVIDING TRANSPARENT AND SECURE ACCESS TO CITY DATA.	http://www.governing.com/smarter/ public-safety/Becoming-a-smarter-city-Six-public-safety-projects-that-deliver-quick-results.html?promo_code=Microsite%20Module
122			HOUSTON, TEXAS		
123			LAS VEGAS		
124			NEW YORK	NEW YORK CITY 311 IS A CENTRALIZED AND ALL- PURPOSED CUSTOMER SERVICE CENTER FOR NEW YORK'S CITIZENS, PROVIDING THEM ACCESS TO NON-EMERGENCY MUNICIPAL SERVICES. THE SERVICE IS AVAILABLE 24 HOURS A DAY AND SEVEN DAYS A WEEK.	https://www1.nyc.gov/site/forward/innovations/smartnyc.page
125			ORLANDO		
126			PHILADELPHIA	AN EXAMPLE OF SMART SERVICE, PHILADELPHIA IMPLEMENTED THE INNOVATIVE 311 NON-EMERGENCY CONTACT PROGRAM (PHILLY311).	https://publications.iadb.org/handle/11319/7725
127			PORTLAND, OREGON	IT HAS RECEIVED THE "INTELLIGENT TRANSPORTATION SYSTEMS AMERICA SMART CITY AWARD" AS NATIONAL LEADER IN USA FOR THE USE OF TRANSPORTATION TECHNOLOGY.	https://www.portlandoregon.gov/ogr/article/473108
128			SAN DIEGO		
129			SAN FRANCISCO	THE GREENEST CITY IN THE USA AND CANADA GREEN CITY INDEX AND THE CLEANTECH CAPITAL OF NORTH AMERICA. CONSIDERED A LEADER CITY ON SMART STRATEGIES FOR SUSTAINABILITY AND INNOVATION.	http://www.sfenvironment.org/ news/update/designing-a-smarter- and-more-sustainable-san-francisco
130			SANTA BARBARA		
131			SANTA CLARA	SANTA CLARA OPENED A COMMUNICATIONS NETWORK TO PROVIDE FREE PUBLIC OUTDOOR WI-FI ACCESS THROUGH THE CITY.	http://smartcitiescouncil.com/ resources/silicon-valley-powers-free- w-fi
132			SEATTLE	THE SEATTLE BUILT SMART PROGRAM AIMS TO GUIDE THE DESIGN AND CONCEPTION OF GREEN, HEALTHY AND COMFORTABLE BUILDINGS.	http://www.seattle.gov/light/ conserve/resident/cv6_bs.htm
133			TACOMA		https://smartcitiescouncil.com/article/how-microsoft-helped-tacoma-teachers-teach-better-data-they-already-have
134			WILMINGTON, NORTH CAROLINA		
135	OCEANIA	AUSTRALIA	BRISBANE	CITYSMART IS AN AGENCY TO PROMOTE SUSTAINABILITY THROUGH INNOVATIVE PROJECTS THAT HELP CUT THE CITY'S CARBON FOOTPRINT AND ALSO POTENTIATE ECONOMIC OPPORTUNITIES.	http://www.citysmart.com.au/
136			QUEENSLAND		
137			SYDNEY		

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
138	WESTERN EUROPE	AUSTRIA	VIENNA	SMART CITY VIENNA GOAL IS TO DEVELOP INTELLIGENT AND INNOVATIVE ICT SOLUTIONS ABLE TO MAKE SUSTAINABLE USE OF RESOURCES.	https://smartcity.wien.gv.at/site/en/ : https://smartcity.wien.gv.at/site/files/2014/11/14032/4_KF_SZW_gesamt_ENG.pdf
139		BELGIUM	BRUSSELS	THE SMART CITY STRATEGY TRIES TO RESPOND TO CHALLENGING ISSUES FOR THE DEVELOPMENT OF THE REGION: A CONNECTED REGION, A SUSTAINABLE REGION, AN OPEN REGION, AND A SAFE REGION.	http://bric.brussels/en/about-the-bric/smart-brussels-a-smart-city-strategy-for-the-brussels-capital-region
140			ANTWERP	BLUE GATE ANTWERP IS ONE OF THE MOST IMPORTANT ECONOMIC PROJECTS IN THE REGION, SUSTAINABILITY IS THE KEYWORD AND ECO-EFFECTIVENESS IS THE GUIDING PRINCIPLE.	http://www.bluegateantwerp.eu/en/partners
141		DENMARK	AARHUS	SMART AARHUS IS A NEW MINDSET DEVELOPED IN ORDER TO CREATE SUSTAINABLE URBAN INNOVATION AND GROWTH.	http://www.smartaarhus.eu/
142			BORNHOLM	THE SMART CITY PLAN HAS FOUR CORNERSTONES: SUSTAINABLE BUSINESS, GOOD LIFE, GREEN TECHNOLOGY AND NATURE DESTINATION.	http://brightgreenisland.com/
143			COPENHAGEN	THE CITY GOAL IS TO PROMOTE SUSTAINABLE DEVELOPMENT WITH SOLUTIONS AS: TRANSPORT AND CYCLING, CLEAN HARBOR AND REDUCE WASTE.	https://stateofgreen.com/en/profiles/city-of-copenhagen
144			THISTED		
145		FINLAND	HELSINKI	THE CITY'S TESTING SMART CITY SERVICES - LIVING LAB. THE GOAL IS TO BE A LEADING TESTING ENVIRONMENT FOR SMART CITY SERVICES.	http://www.forumvirium.fi/en/project-areas/smart-city
146			OULU	INTERNATIONALLY RECOGNITION AS INNOVATION CENTER OF SMART CITY: TECHNOLOGY, BUSINESS MODELS AND PARTNERSHIPS.	
147			TAMPERE	THE SMART CITY MODEL OF TAMPERE AIMS: INTELLIGENT TRANSPORT SYSTEMS, FUTURE HOUSING AND RESOURCE-SAVVY NETWORKS.	http://www.investtampere.fi/how/innovation-programmes/innovative-cities-inka/inka-in-the-tampere-region/smart-city-tampere/
148		FRANCE	ISSY-LES-MOULINEAUX		
149			LYON		
150			NICE	THE CONNECTED BOULEVARD INITIATIVE IS A (PILOT) EXPERIMENT TO STUDY THE BENEFITS THAT CAN BE DELIVERED FROM INTERNET OF EVERYTHING (IOE) APPLICATIONS IN THE CITY.	http://www.cisco.com/c/dam/en/us/solutions/collateral/industry-solutions/case-study-connected-blvd-iae.pdf
151			PARIS	PARIS IS KNOWN FOR ITS INNOVATIVE AUTOLIB' PROJECT, A PROJECT FOR A PUBLIC TRANSPORTATION SERVICE WITH ELECTRIC CARS.	https://www.autolib.eu/en/our-commitment/urban-revolution/
152		GERMANY	BERLIN	SOME INITIATIVES INCLUDE CITY OPEN DATA AND CITY ELECTRO-MOBILITY.	http://www.berlin-partner.de/fileadmin/user_upload/01_chefredaktion/02_pdf/publikationen/Smart_City_A4-Folder_e_web.pdf
153			COLOGNE	MAIN SMART CITY SECTORS INCLUDE: ENERGY, TRANSPORT AND MOBILITY, AND ICT. COLOGNE HAS MANY ONGOING SMART CITY PROJECTS SUCH AS, "KLIMA STRASSE", SHIP- TO-GRID AND SMART METERING.	http://www.smartcity-cologne.de
154			HAMBURG	INVESTMENT ON PORT INTO A "SMART PORT" THAT USES A COMPUTERIZED TRAFFIC MANAGEMENT SYSTEM TO REDUCE GRIDLOCK.	http://www.cisco.com/web/tomorrow-starts-here/cars/hamburg/index.html?CAMPAIGN=Internet+of+Everyt_8
155			MANNHEIM	MANNHEIM CONNECTED EVERY HOUSEHOLD IN THE CITY TO A SMART ENERGY NETWORK.	http://www.dac.dk/en/dac-cities/sustainable-cities/all-cases/energy/mannheim-smart-city/
156			MUNICH	MUNICH SMART CITY STRATEGY AIMS TO REDUCE CARBON EMISSIONS, REDUCE CONSUMPTION OF ENERGY, DEVELOP THE ECONOMY AND ENSURE A GOOD QUALITY OF LIFE. MUNICH IS ALSO KNOWN BY ITS SMART ENERGY GRID SYSTEM.	http://www.muenchen.de/rathaus/dms/Home/Stadtverwaltung/Referat-fuer-Arbeit-und-Wirtschaft/foerderung/pdf/IRBC-Benchmarking-2014-/WS-I-I-Lang.pdf
157		GREECE	ATHENS	COMMUNITY PLATFORM FOR FUNDING PROJECTS.	http://www.synathina.gr/en
158			THESSALONIKI	THE CITY IS DEPLOYING BROADBAND NETWORKS, SMART URBAN SPACES, WEB-BASED APPLICATIONS, AND E-SERVICES PURSUING THE OBJECTIVES OF INCREASING COMPETITIVENESS AND PROMOTING SUSTAINABLE DEVELOPMENT.	
159		ITALY	BOLOGNA		http://www.elevatormagazine.com/en/icity-rate-2017-milano-la-citta-italiana-piu-smart/
160			MILANO		http://www.milanosmartcity.org/joomla/

REF	REGION	COUNTRY	CITY	SMART INITIATIVE	SOURCE
161	WESTERN EUROPE	ITALY	FLORENCE	RECOGNIZED BY THE MILAN-BASED INFORMATION AND COMMUNICATION TECHNOLOGY FAIR, SMAU, FOR INCREASING THE CITY'S SOCIAL INFRASTRUCTURE AND MAKE DATA AND INFORMATION MORE ACCESSIBLE TO THE PUBLIC.	http://firenzesmartcity.org/; http://www.enviroifi.eu/Portals/88/Docs/Project/Presentations/130306_Dublin/Vannuccini-Opendata_in_city_of_Florence.pdf
162		IRELAND	DUBLIN	DIGITAL DUBLIN IS THE CITY'S POLICY AND PRACTICE INITIATIVE THAT IDENTIFIES, MAP, BENCHMARK AND SET TARGETS FOR THE DEVELOPMENT OF A DUBLIN THAT IS INNOVATIVE, AND USES DIGITAL TOOLS AND SOLUTIONS EFFECTIVELY, EFFICIENTLY AND ASSISTS TO DRIVE THE ECONOMY OF THE CITY.	http://digitaldublin.ie
163		LUXEMBOURG	LUXEMBOURG		https://www.list.lu/en/cooperations/innovation-programmes/smart-cities/
164		NETHERLANDS	AMSTERDAM	AMSTERDAM SMART CITY IS ORGANIZED IN EIGHT DOMAINS: SMART MOBILITY, SMART LIVING, SMART SOCIETY, SMART AREAS, SMART ECONOMY, BIG AND OPEN DATA, INFRASTRUCTURE, AND LIVING LABS.	http://amsterdamsmartcity.com/
165			EINDHOVEN		
166			ENSCHEDE	VEHICLE INDUCTIVE PROFILE. EVERY DETECTED VEHICLE LEAVES A UNIQUE MASS-INDUCTION PROFILE, COMPARABLE TO A DNA PROFILE OR FINGERPRINT.	http://imtech.com/EN/Traffic-infra/ Traffic-Infra-Newsroom/Divisie- Imtech-Traffic-Infra-Homepage- Newsroom-Highlights/City-of- Enschede-treats-road-users-as-VIPs.html
167			ROTTERDAM	ROTTERDAM HAS A CLIMATE CHANGE ADAPTATION STRATEGY PROVIDING THE MOST PROMINENT EXAMPLES OF SMART CITY SERVICES, INCLUDING THE CONSTRUCTION OF WATER SQUARES AND GREEN ROOFS, AS WELL AS THE HEAT TRANSPORT NETWORK.	http://www.deltacities.com/ newsletter/rotterdam-proclaimed- smart-city-2014?news_id=58
168			TILBURG	SMART INTERACTIVE STREETLIGHTS THAT PROVIDE LIGHT ON DEMAND, WHENEVER AN ACTIVITY IS REGISTERED ON THE ROAD.	http://www.living-planit.com/ design_wins.htm
169		PORTUGAL	MATOSINHOS		http://smartcity.bcn.cat/en
170			PAREDES	THE FUTURE CITY WILL HAVE A LIVING LABORATORY FOR PARTNERS AND COMPANIES, TEST BED FOR SMART TECHNOLOGIES, INNOVATION CENTER AND AN INCUBATOR FOR TECHNOLOGY START-UPS.	
171		SPAIN	BARCELONA	IT HAS SEVERAL INNOVATIVE SOLUTIONS FOR SMART CITY SERVICES TO MANAGE CITY RESOURCES AND IMPROVE CITIZENS' QUALITY OF LIFE.	http://www.bm30.es/homeage_uk.html
172			BILBAO	STRATEGIC PLAN FOR THE REVITALIZATION OF METROPOLITAN BILBAO ENVISIONS AN "INTELLIGENT AND INTEGRATED" URBAN GROWTH.	
173			MALAGA		
174			SANTANDER	THE GOAL IS TO CREATE A CITY-SCALE EXPERIMENTAL FACILITY WITH TYPICAL APPLICATIONS AND SERVICES FOR SMART CITIES.	http://www.smartsantander.eu/
175			ZARAGOZA	ZARAGOZA IMPLEMENTED ITS BITCARRIER CITYSOLVER SOLUTION IN ORDER TO HAVE THE CITY TRAFFIC INFORMATION IN REAL TIME, TAKE DECISIONS TO MANAGE TRAFFIC EFFICIENTLY AND PROVIDE CITIZENS WITH SUCH INFORMATION SO THAT THEY CAN MAKE THEIR OWN CHOICES.	http://www.bitcarrier.com/zaragoza
176		SWEDEN	GOTHENBURG	THE CELSIUS PROJECT IN THE CITY OF GOTHENBURG LOOKS FOR CREATING AN INTELLIGENT HEATING SYSTEM COVERING ALL HOUSES AND BUILDINGS. THE OBJECTIVE IS TO HAVE RESOURCE EFFICIENT HEAT AND COOLING SYSTEMS.	http://celsiuscity.eu/
177			STOCKHOLM	THE STOCKHOLM'S KEY PRIORITIES IN DEVELOPING A SUSTAINABLE SMART CITY INCLUDE THE ENVIRONMENT AND ICT TECHNOLOGIES. STOCKHOLM HAS DEFINED FOR ITS SMART CITY PLAN GREEN IT AND E-SERVICES (PUBLIC SERVICES) STRATEGIES.	http://international.stockholm.se/ city-development/the-smart-city/
178		UK	BELFAST, NORTH IRELAND	THE CITY'S VISION IS A CITY WHERE ICTS AND INTELLIGENCE ARE USED TO CREATE SMART, SUSTAINABLE CITIES WITH HIGH QUALITY LEVELS FOR LIVING AND WORKING.	https://connect.innovateuk.org/documents/3301726/3794125/Feasibility+Study+-+Belfast+City+Council.pdf/12a5ef1a- b06a-4163-9271-94d18ab94b7d
179			BLETCHLEY	BLETCHLEY WAS CONSIDERED AS THE FIRST INTELLIGENT CITY REALIZED WITH THE PURPOSE OF BENEFITTING FROM KNOWLEDGE AND INFORMATION FLOW IN THE CONTEXT OF SPATIAL INTELLIGENCE PROXIMITY.	http://www.urerio.org/2015/01/22/smart-city-strategy-bletchley-park-uk/
180			COVENTRY	COVENTRY BECOMES A LIVING LAB AND A MEMBER OF THE EUROPEAN NETWORK OF LIVING LAB. THE INITIATIVE CONTRIBUTED TO IDENTIFY COVENTRY AS AN ACTIVE CITY IN THE SMART CITY DOMAIN.	http://citylabcoventry.org/home.asp?silevel=0z0&parent_id=1
181			EDINBURGH, SCOTLAND	SMART CITIES PILOTS TO DELIVER CUSTOMER SERVICES DEFINED IN THE STRATEGY AND IMPROVE THE COUNCIL'S SERVICES.	http://www.smartcities.info/ edinburgh http://www.edinburgh.gov.uk
182			GLASGOW, SCOTLAND		
183			LONDON	SMART LONDON VISION AIMS TO ARM THE CITY WITH TECHNOLOGY INNOVATIONS MAKING LIFE, WORK AND INVESTMENTS IN LONDON EVEN BETTER.	http://www.london.gov.uk/media/ mayor-press-releases/2013/03/ mayor-announces-smart-london- board-to-realise-london-s-ambition
184			MANCHESTER	CORRIDOR MANCHESTER IS A BUSINESS SITE THAT AIMS TO BE THE HEART OF MANCHESTER'S KNOWLEDGE ECONOMY.	http://www.corridormanchester.com/our-vision
185			PETERBOROUGH		
186			SOUTHAMPTON		

CODE	CT. REF	COUNTRY	CITY REF	CITY	2016 (THOUSANDS)	2030 (THOUSANDS)	% (COUNTRY)	% URBAN (COUNTRY)
ARG	1	ARGENTINA	1	BUENOS AIRES	15 334	16 956	36.1	39.30%
			2	CÓRDOBA	1 519	1 718	3.6	3.90%
			3	ROSARIO	1 395	1 607	3.3	3.60%
BHS	2	BAHAMAS, THE	1	NASSAU	274			
BRB	3	BARBADOS	0	BRIDGETOWN	110			
BLZ	4	BELIZE	0	BELMOPAN	20			
BOL	5	BOLIVIA	0	LA PAZ	1 834	2 308	16.4	23.80%
			1	SANTA CRUZ DE LA SIERRA	2 181	2 989		
BRA	6	BRAZIL	1	BRASILIA	4 235	4 929	2.1	2.40%
			2	RIO DE JANEIRO	12 981	14 174	6.3	7.40%
			3	CURITIBA	3 537	4 116	1.7	2.00%
			4	PORTO ALEGRE	3 621	4 028	1.8	2.10%
			5	FORTALEZA	3 944	4 551	1.9	2.20%
			6	RECIFE	3 767	4 222	1.8	2.10%
			7	NITEROI	496			
			8	ITU	167			
			9	SÃO PAULO	21 297	23 444		
			10	SALVADOR	3 623	4 115		
			11	BELLO HORIZONTE	5 766	6 439		
			12	PIRAI	23			
CHL	7	CHILE	1	SANTIAGO	6 544	7 122	36.2	40.40%
			2	ANTOFAGASTA	380			
			3	VALPARAISO	284			
COL	8	COLOMBIA	1	BOGOTÁ	9 968	11 966	19.9	25.90%
			2	MEDELLIN	3 972		7.9	10.30%
			3	CALI	2 682	3 203	5.4	7.00%
CRI	9	COSTA RICA	0	SAN JOSÉ	1 183	1 501	23.4	30.10%
CUB	10	CUBA	0	HAVANA	2 129	2 104	18.9	24.5%
DOM	11	DOMINICAN REPUBLIC	0	SANTO DOMINGO	3 020	3 888	28	35.1%
ECU	12	ECUADOR	1	QUITO	1 754	2 228	10.7	16.60%
			2	GUAYAQUIL	2 756	3 493		
SLV	13	EL SALVADOR	0	SAN SALVADOR	1 102	1 254	17	25.40%
GTM	14	GUATEMALA	0	GUATEMALA CITY	2 994	4 650	18	34.60%
GUY	15	GUYANA	0	GEORGETOWN	131			
HTI	16	HAITÍ	0	PORT-AU-PRINCE	3 525	3 525	23.3	39.0%
HND	17	HONDURAS	0	TEGUCIGALPA	1 146	1 613	13.3	24.10%
JAM	18	JAMAICA	0	KINGSTON	662			
			1	MONTEGO BAY	110			
MEX	19	MEXICO	1	MEXICO CITY	21 157	23 865	16.7	21.00%
			2	CHIHUAHUA	870			
			3	GUADALAJARA	4 920	5 837	3.9	4.90%
			4	TOLUCA	2 207		1.7	2.20%
			5	ZAPOPAN	1 332			
			6	MONTERREY	4 589	5 471		
			7	CIUDAD OBREGÓN	405			
			8	DURANGO	580			
			9	TUXLA GUTIERREZ	533			
NIC	20	NICARAGUA	0	MANAGUA	1 042			
PAN	21	PANAMÁ	0	PANAMA CITY	1 708	2 221	42.2	63.10%
PRY	22	PARAGUAY	0	ASUNCIÓN	2 406	3 315	33.7	56.20%
PER	23	PERÚ	1	LIMA	10 072	12 221	31.9	40.40%
			2	TRUJILLO	823			
			3	CUSCO	420			
SUR	24	SURINAM	0	PARAMARIBO	2 460	2 468		
TTO	25	TRINIDAD Y TOBAGO	0	PORT OF SPAIN	22			
URY	26	URUGUAY	1	MONTEVIDEO	240		49.9	52.20%
VEN	27	VENEZUELA, RB	0	CARACAS	37		9.2	10.30%
PRI	*	PUERTO RICO	0	SAN JUAN	1 716	1 860	66.9	71.5%
PRI	*	PUERTO RICO	1	BARCELONETA	2 923	3 347		

Table 9. Urbanization in Latin America and the Caribbean.

DEMOCRACY INDEX
- AUTHORITARIAN REGIME
- HYBRID REGIME
- FLAWED DEMOCRACY
- FULL DEMOCRACY
- NO DATA

Map 19. Democracy Index and smart cities.

INCOME INDEX
LOW INCOME
LOWER MIDDLE
UPPER MIDDLE INCOME
HIGH INCOME
NO DATA
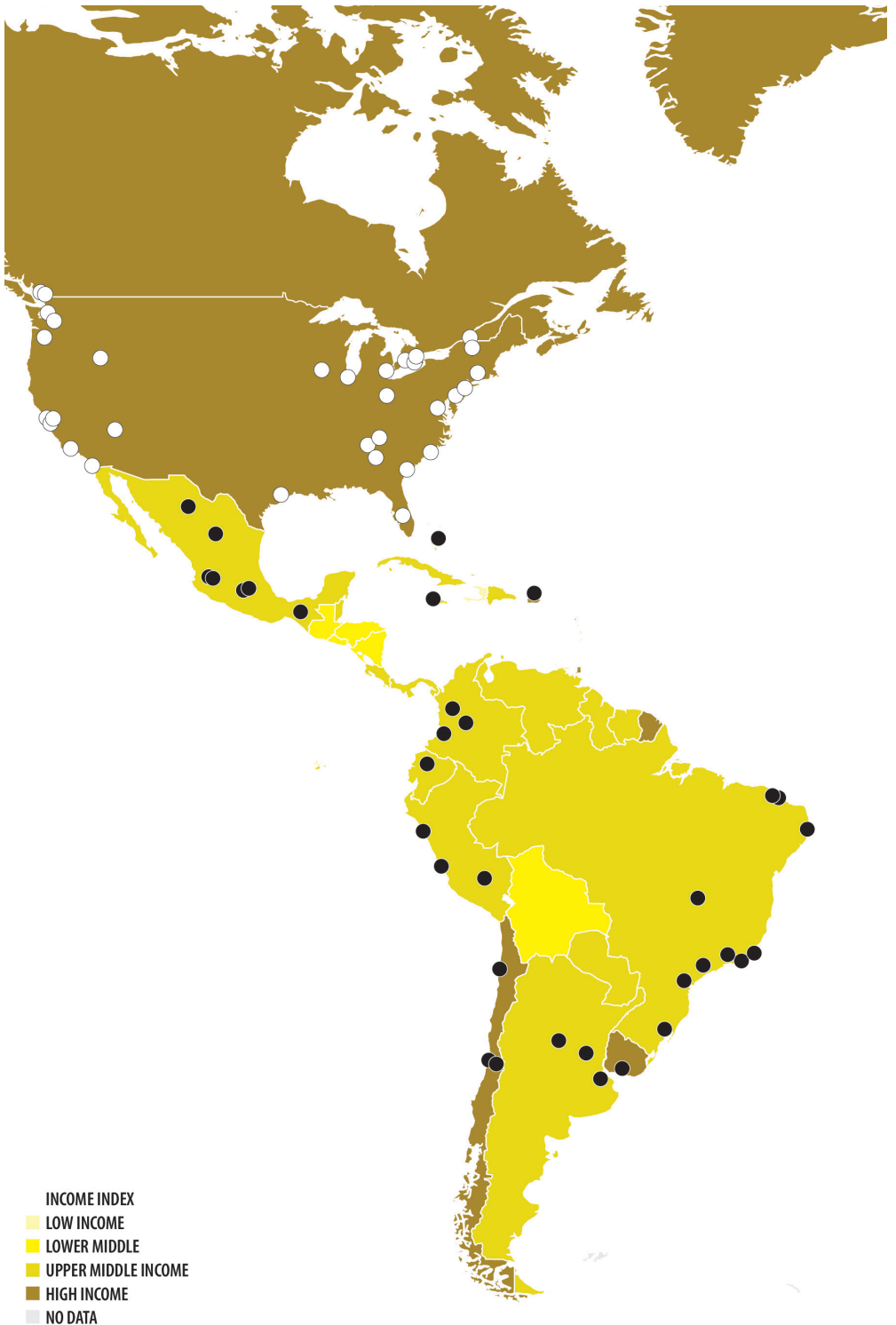
Map 20. Income index and Smart Cities.

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REF	COUNTRY	REF	CITY	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	MO	EN	PE	LI	GOV
1	ARGENTINA	1	BUENOS AIRES	DISTRITO TECNOLOGICO	URBAN RENOVATION AND CLUSTER DEVELOPMENT - TECH POLE.	MINISTRY OF URBAN DEVELOPMENT	PUBLIC	http://www.buenosaires.gob.ar/innovacion/distrito seconomicos/distritotecnologico	1					
				BA METRO	EXPANSION OF NETWORK OF TRANSPORT SYSTEM					1			1	
				ECOBICI	ECOBICI SYSTEM AND INFRASTRUCTURE FOR CYCLING			http://www.buenosaires.gob.ar/ecobici		1				
					THROUGH ITS PARTICIPATION IN THE MICROSOFT CITYNEXT INITIATIVE, IS DEVELOPING SOLUTIONS, LIKE CITY MOBILITY AND INCIDENTS REGISTRATION, TO MODERNIZE THE CITY.			http://smartcitiescouncil.com/ resources/buenos-aires-uses-it-solutions-and-programs-support-government-citizens-youth		1				
					CREATION OF WIDE GREEN AREAS SUCH AS A SECTION OF THE STREETS WITH GREENERY AS TREES, THAT ALSO AIMS TO REDUCE CARBON FOOTPRINT						1			
				BA WI - FI	ACCESS TO FREE TELECOMMUNICATION NETWORK.	MINISTRY OF MODERNIZATION	PUBLIC	http://www.buenosaires.gob.ar/innovacion/ciudadi nteligente				1		
					E-GOVERNMENT SYSTEM; PROJECTS AND DATA OF THE CITY ARE PROMOTED IN THE MUNICIPAL WEB PORTAL									1
				INTEGRATED RESPOND SYSTEM	IN ORDER TO MONITOR, PREVENT AND PREPARETE FOR EXTREME WEATHER EVENTS.						1		1	
				UNIFIED EMERGENCY COORDINATION AND CONTROL CENTRE (CUCC)	UNIFIED EMERGENCY COORDINATION AND CONTROL CENTRE (CUCC) INTEGRATED RESPOND SYSTEM, TO BE PREPARED FOR EXTREME WEATHER EVENTS						1		1	
	CÓRDOBA	2			UPGRADING THE EDUCATION PLUS INTEGRATING NEW CULTURAL PROGRAMS								1	
	ROSARIO	3			DEVELOPMENT OF TECHNOLOGIES FOR URBAN SERVICES.	IBM	PRIVATE					1		
2	BRAZIL	1	BRASILIA		IMPROVEMENT OF THE TRANSPORT SYSTEM					1				
		2	RIO DE JANEIRO	RIO DE JANEIRO OPERATIONS CENTER (COR-RIO)	A MONITORING CENTRE THAT WORKS WITH CAMERAS AND DIGITAL MAPPING SYSTEM, IN ORDER TO PREDICT GROUND SLIDES AND BE ABLE TO HAVE QUICK RESPONSE AND WARM THE POPULATION; SENSORS ARE PLACED IN SLOPES AND CONNECTED TO INTEGRATED METEOROLOGICAL DATA AND NEW COMMUNICATIONAL TOOLS.	CIVIL DEFENSE	PUBLIC							1
				GEO-RIO	LANDSLIDE PREVENTION SYSTEM DATA COLLECTION	OPERATION CITY CENTRE / IBM	PUBLIC / PRIVATE				1			1
				MAPEAMENTO DIGITAL LIDERADO POR ADOLESCENTES E JOVENS	DIGITAL MAPPING OF HOT SPOTS TO TACKLE SANITARY PROBLEMS AS THE TRASH ACCUMULATION AND PREVENTION OF MOSQUITOES' CONCENTRATION WHICH ARE RESPONSIBLE FOR SOME VIRAL DISEASES AS DENGUE.	LOCAL TEENAGERS	COMMUNITY	http://rio.unicef-gis.org			1		1	
				DATA RIO PROJECT	DATABASE GENERATION FOR STUDIES AND APP DEVELOPMENT	GOVERNMENT OF RDJ	PUBLIC				1			1
				CARIOCA DIGITAL PROJECT	CITY MANAGEMENT THROUGHT WEB PORTAL	GOVERNMENT OF RDJ	PUBLIC							1
				WI FAVELA	A COLLABORATION BETWEEN STREET ARTIST AND TELECOM COMPANY IN ORDER TO CREATE INTERNET HOT-SPOTS.			http://www.businessinsider.com/rio-favela-rocinha-has-its-own-wifi-provider-2016-6?IR=T			1	1		
				SOLAR PANELS	INSTALLATION OF SOLAR PANELS IN SLUMS, DOING USE OF THE ABUNDANCE OF SUN HOURS.			https://www.theguardian.com/sustainable-business/2016/may/24/favelas-solar-energy-projects-brazil			1		1	
				LED FLOODLIGHTS WITH ENERGY FROM FOOTSTEPS	INSTALLATION OF KINETIC TILES BURIED TO CAPTURE THE ENERGY GENERATED BY THE PLAYERS' FOOTSTEPS TO GENERATE ENEGY AND SUPPLY THE LED FLOODLIGHTS IN THE SURROUNDINGS OF THE PITCHES.						1		1	

REF	COUNTRY	REF	CITY	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	OW	EN	PE	LI	GOV
		3	CURITIBA	BRT	TRANSPORT SYSTEM TO IMPROVE THE ACCESSIBILITY OF THE CITY.			https://www.whatagreenlife.com/the-first-smart-city-in-the-world-curitiba/		1				1
				RESILIENCE GREEN AREAS	GREEN SPACES WHICH DURING THE RAINY SEASON ARE ABLE TO ABSORB RUNOFF WHILE ON THE DRY SEASON, WATER TURNS ON PARKS.			https://www.siemens.com/entry/cc/features/green cityindex_international/all/en/pdf/report_latam_en.pdf			1			
					INTEGRATED CO-CREATED CITY SHARING DATA.	IBM	PRIVATE					1		1
				MASTER PLAN	FOR THE GROWTH OF THE CITY, IT INCLUDES CONNECTIVE CORRIDORS, LARGE PARKS, NEIGHBORHOOD PARKS AND SOCIAL SPACES.	LOCAL GOVERNMENT	PUBLIC				1			
				THE SMART URBAN MOBILITY LAB (SUM-LAB)	AN INITIATIVE IN WHICH RESEARCHERS COOPERATE, STUSY, ANALYZE AND TEST INNOVATIVE MOBILITY SOLUTIONS, USING THE CITY AS A LIVING LAB.	PONTIFICAL CATHOLIC UNIVERSITY OF PARANÁ (PUCPR) FEDERAL UNIVERSITY OF TECHNOLOGY - PARANÁ (UTFPR) THE UNIVERSITY OF TWENTE MUNICIPALITY OF CURITIBA.		https://www.utwente.nl/en/curitiba/	1					1
		4	PORTO ALEGRE	DIGITAL DATA POA	OPEN DATA FOR PARTICIPATORY BUDGETING, TAXES ALLOCATION; ENHANCING PROGRAMMERS, COMPANIES AND CITIZENS TO CREATE DIGITAL SERVICES.	IBM LOCAL GOVERNMENT GLOBAL ELECTRONIC BANKING	PRIVATE PUBLIC PRIVATE	http://www.datapoa.com.br				1		1
		5	FORTALEZA	POLE OF COMMERCE AND FINANCE	CONCENTRATES IMPORTANT BUSINESS AND FINANCE NETWORKS, CONSOLIDATING AS THE ECONOMIC POLE OF THE NORTH REGION				1					
		6	RECIFE		INVESTMENT ON URBAN AND TECHNOLOGICAL DEVELOPMENT				1					
		7	NITEROI	INTEGRATED PUBLIC SECURITY CENTRE (CISP)	INTEGRATION OF SECURITY FORCES, WITH THE USE OF PANIC BUTTONS THAT ARE CONNECTED TO THE INTEGRATED PUBLIC SECURITY CENTRE - CISP, IT IS ABLE TO CALL AND ALERT TO THE STATE, FEDERAL AND MUNICIPAL SECURITY FORCES WHEN NEEDED IN EMERGENCY CASES, ALSO TO THE FIRE DEPARTMENT, THE TRANSPORTATION DEPARTMENT - NIT TRANS, AND CIVIL DEFENCE. IN THE LAST PERIOD, THE CISP HAD RECEIVED DATA FROM AROUND 600 MONITORING CAMERAS, SOME OF THEM WITH A HIGH LEVEL OF TECHNOLOGY THAT OFFER A 360-DEGREE RANGE OF IMAGE CAPTURE AND IS PROVIDED WITH FIXED AND MOBILE PANIC BUTTONS.	FIRE DEPARTMENT TRANSPORTATION DEPARTMENT (NITTRANS) CIVIL DEFENSE	PUBLIC							
				BUS WITH HIGH LEVEL OF SERVICE				https://www.smartcitiesdive.com/ex/sustainablecitiescollective/niter-i-brazil-first-cty-adopt-bus-high-level-service-bhls-system/42926 1/		1				1
		8	ITU		SELECTIVE GRABAGE COLLECTION SYSTEM	ENVIRONMENT SECRETARIAT	PUBLIC				1			
		9	PIRAI	PIRAI DIGITAL CITY	FOCUSING ON THE INVESTMENT OF THE HUMAN CAPITAL AND THE DIGITAL INCLUSION THROUGH THE IMPLEMENTATION OF THE PROJECT, BUT MUNICIPALITY HAS STRUGGLED INTO FIND INVESTMENT OPPORTUNITIES WHILE PROMOTING THE PROVISION OF WI-FI BROADBAND IN PUBLIC AREAS AND THE CREATION OF AN EDUCATIONAL TECHNOLOGY CENTRE.	MUNICIPALITY						1		
		*		LAGUNA SMART CITY	PUBLICIZED AS THE FIRST SOCIAL SMART CITY IN BRAZIL, ITS DEVELOPMENT WILL INCLUDE BIG GREEN AREAS, RESIDENCE, COMMERCE AND INDUSTRY.		PUBLIC	http://smartcitylaguna.com.br https://www.planetsmartcity.com/en/2017/12/smart-city-laguna-has-been-awarded-by-the-sindicato-dos-engenheiros-association-of-professional-engineers-from-the-state-of-san-paolo-brazil/					1	

REF	COUNTRY	REF	CITY	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	MO	EN	PE	LI	GOV
3	CHILE	1	SANTIAGO	DO! SMART CITY	EVENTS PROMOTING INITIATIVES	PAIS DIGITAL FRAUNHOFER RESEARCH THINK TANK UNIVERSIDAD DEL DESARROLLO	NON PROFIT							1
					MONITORING ENVIRONMENTAL POLLUTION					1	1			
				METRO + BIKE	USB SENSORS TO TRACK TRAFFIC CONGESTION					1				
					IMPROVEMENT OF PUBLIC TRANSPORT SYSTEM	MINISTRY OF TRANSPORTATION AND TELECOMMUNICATIONS (MTT) COMPANY B-CYCLE ITAUBANK	PUBLIC PRIVATE PRIVATE			1				
					CONTROL CENTRES TO MONITOR TRAFFIC IN REAL TIME	MINISTRY OF TRANSPORTATION AND TELECOMMUNICATIONS (MTT)	PUBLIC			1				
					AUTOMATED TOLL PRICING IN HIGHWAYS	MINISTRY OF TRANSPORTATION AND TELECOMMUNICATIONS (MTT)	PUBLIC			1				1
				START-UP CHILE	PUBLIC START-UP ACCELERATOR	GOVERNMENT MINISTRY OF ECONOMY CHILEAN ECONOMIC DEVELOPMENT CORPORATION (CORFO)	PUBLIC	http://www.startupchile.org/				1		
				SMART CITY SANTIAGO	IT WAS THE FIRST SMART CITY PROTOTYPE OF CHILE, TRYING TO EXPLORE ALL THE DIMENSIONS OF THE SMART CITY MODEL, A BUSINESS CENTRE AND TRY ENERGY SOLUTION AS THE SMART GRID. EV CAR SHARING PROGRAM	ENET (CHILECTRA)		http://www.smartcitysantiago.cl/					1	
					DATA COORDINATION AND SERVICES TO RESPOND TO DISASTERS	ENET (CHILECTRA) IBM REGIONAL, MINICIAPL, NATIONAL GOVERNMENT	PRIVATE PUBLIC			1	1			
		2	ANTOFAGASTA		WATER MANAGEMENT	IBM	PRIVATE				1			
					PROMOTION OF ENTERPRENEUR PROJECTS AND INNOVATION	IBM	PRIVATE			1				
		3	VALPARAISO	VALPARAISO TRAIN (MERVAL)	IMPROVE MOBILITY SYSTEM	IBM REGIONAL GOVERNMENT	PRIVATE PUBLIC			1				1
				METROPOLITAN TRANSPORT OF VALPARAISO (TRANS VALPARAISO)		GRAN CHILEAN MINISTRY OF TRANSPORTATION				1				
4	COLOMBIA	1	BOGOTÁ	BRT + BICYCLE + TRANSMILENIO	INTEGRATION OF PUBLIC TRANSPORT SYSTEM AND HAD IMPLEMENTED A SPACE RATIONING STRATEGY RESTRICTING THE USE OF CARS ACCORDING THE NUMBER OF LICENSE PLATE AND THE CALENDAR DAY, DOING A DIFFERENCE BETWEEN ODD AND EVEN NUMBERS AND VICEVERSA, AND TO REINFORCE THE USE OF PUBLIC TRANSPORT THE CITY.			http://www.huffingtonpost.com/don-tapscott/the-heartbeat-of-bogota-e_b_1222247.html	1					
				ELECTRIC BICYCLE ELECTRIC TAXI	PROMOTION OF THE USE OF SUSTAINABLE MOBILITY ALTERNATIVES. ELECTRIC MOBILITY SYSTEM EXPANSION OF TRANSPORT NETWORK	BYD COMPANY	PRIVATE			1				
				ELECTRIC UNDERGROUND METRO		GOVERNMENT	PUBLIC			1				
				CITIZEN ENGAGEMENT WIH DIGITAL	CREATION OF COLLABORATIVE NETWORKS TO CREATE PROPOSALS TO BE INCLUDED IN THE MUNICIPAL AGENDA; PROMOTE THE CITY AS DESTINY FOR INVESTMENT, TECHNOLOGICAL HUB AND HOST OF MEGAEVENTS, AN EMPLOYMENT PLAN INTO PUBLIC-PRIVATE PROGRAM IN ORDER TO CREATE NEW JOBS; AN E-GOVERNMENT SYSTEM TO IMPROVE THE MANAGEMENT OF THE CITY WHILE PROMOTING AN EFFECTIVE CITIZEN PLATFORM; IMPROVE THE EDUCATION SYSTEM; AND THE DEVELOPMENT OF AN URBAN AN SUSTAINABLE PLAN FOR THE CITY IN ORDER TO CONTROL THE URBAN GROWTH.	MUNICIPALITY COMMUNITY						1	1	1

REF	COUNTRY	CITY	REF	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	MO	EN	PE	LI	GOV
		MEDELLIN	2	INCLUSIVE MOBILITY	FOCUSED ON THE SOCIAL TRANSFORMATION OF THE CITY THROUGH THE INTEGRATION OF DISMISSED AND PROBLEMATIC AREAS, IMPLEMENTING NEW PUBLIC SPACES AND CULTURE NODES, AS PART OF AN ARTICULATED STRATEGY THAT CONNECTS WITH THE PUBLIC TRANSPORT SYSTEM, SO CITIZENS REGAIN THE RIGHT TO THE CITY.	TRANSPORTATION AND TRAFFIC SECRETARIAT OF MEDELLIN	PUBLIC							1
				INTELLIGENT MOBILITY SYSTEM OF MEDELLIN (SIMM)	INTEGRATION OF INFO AND COMMUNICATION TECHNOLOGIES, INFRASTRUCTURE	MOBILITY CONTROL CENTRE TRANSPORTATION AND TRAFFIC DEPARTMENT	PUBLIC			1				
				ELECTRIC STAIRCASE	ACCESSIBILITY TO HILLSIDE COMMUNITIES WITH AN OUTDOOR ESCALATOR THAT CONNECT TO THE CITY CENTRE REDUCING THE TRAVEL TIME FROM HALF AN HOUR TO JUST 6 MINUTES.	MUNICIPALITY	PUBLIC	https://www.theguardian.com/world/2013/jul/31/medellin-colombia-fast-track-slums-escalators					1	
				INTEGRATED EMERGENCY AND SECURITY SYSTEM (SIES-M)	INTEGRATION OF SECURITY AND EMERGENCY ACTIONS	URBAN SECURITY COMPANY ADMINISTRATIVE DEPARTMENT FOR DISASTER RISK MANAGEMENT ENVIRONMENT AND SOCIAL WELFARE SECRETARIAT	PUBLIC				1			
		CALI	3		IMPROVING POLICIES FOR URBAN DEVELOPMENT								1	1
5	ECUADOR	QUITO	1		IMPLEMENTATION OF MULTIPLES POLICIES AND SUSTAINABLE MODELS TOWARDS THE IMPROVEMENT OF THE GOVERNMENT SYSTEM. PROMOTION OF INITIATIVES AND URBAN EVENTS RELATED TO ENVIRONMENT AND INNOVATION.				1					
6	JAMAICA	MONTEGOBAY	1	SMART CITY INTEGRATED OPERATING CONTROL CENTRE – IOCC	WHICH SYSTEM IS FOCUSED IN MOBILITY WITH A TRAFFIC SIGNAL CONTROL, AUTOMATED TRAFFIC ENFORCEMENT SYSTEM, TAXI AND METRO MANAGEMENT SYSTEM, PARKING INFORMATION SYSTEM AND THE PROVISION OF REAL-TIME INFORMATION FOR THE TRAVELLER; WHILE PREVENTION SYSTEM AIMS TO HAVE EFFECTIVE ACTIONS IN CASES OF CRIME AND DISASTER EVENTS.					1	1			
7	MEXICO	MEXICO CITY	1		INVESTIGATION IN DIGITAL GOVERNANCE AND OPEN DATA INITIATIVES									1
				DIGITAL MEXICO	PROMOTION THE USE OF ICT TECHNOLOGIES AS A TOOL FOR SOCIO-ECONOMIC DEVELOPMENT							1		
				PROGRAM OF SUSTAINABLE BUILDINGS	USE OF TECHNOLOGY IN BUILDINGS, HAS THE MERIT OF BEING A PIONEER IN THE CONSTRUCTION OF SUSTAINABLE AND SMART BUILDINGS, AND SOME OF THEM ARE ABLE TO ABSORB THE CONTAMINATION.								1	
				ECOBICI	BIKE SHARING			https://www.ecobici.cdmx.gob.mx		1				
				CARROT	CAR SHARING SYSTEM	VENTURE PARTNERS AURIA CAPITAL MÉXICO VENTURES	PRIVATE	www.carrot.mx		1				
				AVENTONES	CAR SHARING PLATFORM	ANTONI LELO DE LARREA VENTURE PARTNERS (ALLVP)	PRIVATE	https://www.aventones.com		1				
				URBAN 360 (URBAN DF)	APP FOR SHARING NEWS AN SERVICES			https://play.google.com/store/apps/details?id=com.trafficescape.android&hl=es_419		1				
				WIKICLETA	APP OF BIKING COMMUNITY, TO SHARE DATA OF FRIENDLY ROUTES	NUMA – COMPANY FOR START UP INSTITUTE OF TRANSPORT AND DEVELOPMENT POLICIES - ITDP	PRIVATE NON PROFIT	http://wikicleta.com		1				

REF	COUNTRY	CITY	REF	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	MO	EN	PE	LI	GOV
2		CHIHUAHUA		CHIHUAHUA DIGITAL CITY PROGRAM	TELECOMMUNICATION NETWORK, FREE WI-FI INTERNET	LOCAL GOVERNMENT / LOCAL OPERATORS OF TELECOMMUNICATION SERVICES	PUBLIC / PRIVATE							1
				WIFI ACCESS	AIMS TO EMPOWER CITIZENS TO USE PUBLIC SPACES, PROMOTING ACTIVITIES, OFFERING NEW SERVICES AND IT HAD IMPROVED THE WI-FI COVERAGE TO PROMOTE THE ACCESS FOR FREE.							1		
3		GUADALAJARA		IT PLATFORM	PROCESS MAPPING AND SOCIAL NETWORKING TO CONNECT CITIZENS AND BUSINESS	IBM / LOCAL GOVERNMENT	PRIVATE / PUBLIC		1			1		
				E-GOVERNMENT SYSTEM / CIUDAD CREATIVA DIGITAL – CCD	INTEGRATATION OF SERVICES FOCUS ON THE CREATION OF A PROPER ENVIRONMENT THAT ENABLES THE KNOWLEDGE CREATION, IMPROVING THE QUALITY OF LIFE THROUGH THE PROMOTION OF INNOVATIVE IDEAS AND USE OF TECHNOLOGIES.			http://ccdguadalajara.com/es_ES/				1		1
4		TOLUCA		E-GOVERNMENT SYSTEM	SERVICE INTEGRATION OF THE MUNICIPALITY	IBM / MUNICIPALITY GOVERNMENT	PRIVATE / PUBLIC							1
5		ZAPOPAN			FOOD INDUSTRY CLUSTER FOR INNOVATION	IBM	PRIVATE		1					
6		DURANGO		WIFI ACCESS	INSTALLATION OF WI-FI HOTSPOTS ON PUBLIC PLACES AND EDUCATIONAL INSTITUTIONS.	MUNICIPALITY / TELMEX	PUBLIC / PRIVATE					1		
				TECHNOLOGICAL INCLUSION	PROMOTION OF A TECHNOLOGY PROGRAM FOR UNIVERSITIES AND TECHNICAL SCHOOLS ENABLING TRAINING AND ENABLING ENTREPRENEURSHIP.	MUNICIPALITY	PUBLIC					1		
				DIGITAL DURANGO	AN E-GOVERNMENT NETWORK THAT FOCUSES ON URBAN SERVICES, REDUCE OPERATING COST AND INCREASES TRANSPARENCY; IT ARTICULATES COOPERATION BETWEEN CITIZENS WITH A CALL CENTRE AND A MONITORING SYSTEM THAT IMPROVES PUBLIC SAFETY.	MUNICIPALITY	PUBLIC							1
7		TUXLA GUTIERREZ		E-GOVERNMENT	THE WEB PORTAL OF THE MUNICIPALITY ALLOWS THE ACCESS TO PERMITS, TAXATION AND USE OF GIS APPLICATIONS, WHILE CITIZENS CAN MONITOR THE ADVANCE OF WORKS IN THE CITY.	MUNICIPALITY	PUBLIC	http://www.intelligentcommunity.org/tuxtla_gutierrez_chiapas						1
				VIGILANTE TAX DRIVER	AN ORGANIZED NETWORK OF TAXI DRIVERS THAT REPORT SOME INCIDENTS RELATED TO CRIME, INFRASTRUCTURE CONDITIONS, AND THIS INFORMATION IS COLLECTED INTO A WEB PLATFORM.	COMMUNITY / MUNICIPALITY	COMMUNITY / PUBLIC						1	
8	PERÚ	LIMA	1	SMART CITY PERU	LABORATORY OF SOLUTIONS TO IMPROVE THE QUALITY OF LIFE THROUGH ICT	NATIONAL UNIVERSITY OF ENGENIEERING (UNI) / CASTILLA UNIVERSITY – LA MANCHA (SPAIN) / CONCYTEC / HOCHSCHULE LANDSHUT	PUBLIC	http://www.ctic.uni.edu.pe/index.php/laboratorios/smartcity				1		
				GLIPS & SAVIA	EMPOWERING THE SECURITY SYSTEM THROUGH GEOLOCATION INTERFACE POSITION SYSTEM AND SURVEILLANCE AND ALARM FOR GENDER VIOLENCE APPLICATION	MINISTRY OF PRODUCTION / INTER-AMERICAN DEVELOPMENT BANK (IDB)	PUBLIC / PRIVATE	http://www.smartcityperu.org						1
				WEWANT / SNORUNI	MOBILE APP FOR ECONOMIC AND SOCIAL INTEGRATION MANAGEMENT OF SYSTEMS FOR DETECTION OF INTRUSIONS (IDS) FOR SECURITY				1					
				BEACONS & IOT4X / PYMACHI	INFRASTRUCTURE OF SENSORS - INTERNET OF THINGS DESIGN AND DEVELOPMENT OF A LIBRARY USING MACHINE LEARNING						1	1		
				SAMSUNG SMART SCHOOL PERÚ	IMPLEMENTATION OF TECHNOLOGIES FOR EDUCATION. NATIONAL PROJECT WITH IMPACT IN LIMA, PIURA, CUSCO, TACNA AND MOQUEGUA.	MINISTRY OF EDUCATION (MINEDU) / SAMSUNG	PUBLIC / PRIVATE	http://gestion.pe/tecnologia/samsung-creara-escuelas-y-oficinas-inteligentes-proyecto-smart-school-2093502 https://www.youtube.com/watch?v=1ZY_Plw530Q				1		1

REF	COUNTRY	REF	CITY	PROJECT	DESCRIPTION AND OBJECTIVES	STAKEHOLDERS	ACTOR	SOURCE	EC	MO	EN	PE	TI	GOV
		1		IMPROVEMENT ON TRANSPORT NETWORK	DEVELOPMENT OF POLICIES TOWARDS THE MODERNISATION OF BUSES, THE ESTABLISHMENT OF BUS STOPS, AND THE IMPLEMENTATION OF THE METROPOLITAN BUS OF LIMA, BASED ON THE BRT MODEL, AND THE METRO OF LIMA, THUS CONNECTING THE CITY FROM NORTH TO SOUTH, AND THAT AIMS TO IMPROVE THE ACCESSIBILITY IN THE NEXT DECADE.	METROPOLITAN MUNICIPALITY OF LIMA GEF				1				
				MIRAFLORES 2.0	A WEB PORTAL THAT IMPROVES THE COMMUNICATION WITH THE CITIZEN AND THE MUNICIPALITY.	MUNICIPALITY OF MIRAFLORES		http://andina.pe/ingles/noticia.aspx?id=630902						1
2			TRUJILLO	OF VIDEOS	EMPOWERING THE SECURITY SYSTEM	MUNICIPALITY OF TRUJILLO IBM	PUBLIC PRIVATE	http://gestion.pe/tendencias/lima-smart-habria-menos-trafico-y-mas-agua-2139286					1	
3			CUSCO		PLANIFICATION AND URBAN MANAGEMENT	REGIONAL GOVERNMENT OF CUSCO IBM	PUBLIC PRIVATE						1	1
9	PANAMA	1	PANAMA CITY	INTERNET PARA TODOS	PROVISION OF FREE INTERNET ACCESS AND INSTALLATION OF HOTSPOTS THROUGHOUT THE COUNTRY.	CISCO		https://www.raconteur.net/technology/latin-americas-first-smart-city-arrives				1		
				GRP	A DIGITAL PLATFORM FOR MUNICIPAL MANAGEMENT THAT MADE EFFECTIVE SERVICE FOR PAYING TAXES AND ACCESSING MUNICIPAL INFORMATION.	MUNICIPALITY	PUBLIC							
				PARKING SYSTEM	A SYSTEM OF VALET PARKING THAT USES TAGS STORED IN THE CLOUD ENABLING THE DROP OFF OF CARS ANYWHERE WITHIN THE DISTRICT, FROM WHERE IT IS DRIVEN TO A CAR PARK OUTSIDE THE CASCO VIEJO DISTRICT.					1				
10	URUGUAY	1	MONTEVIDEO	SOFTWARE AND TECHNOLOGICAL DEVELOPMENT	BOASTS THE UNIVERSITIES WITH ACTIVE PROGRAMS SUPPORTING ENTREPRENEURSHIP IN THE PRODUCTION AND EXPORTATION OF SOFTWARE			https://www.fastcompany.com/3022533/the-8-smartest-cities-in-latin-america#3				1		
				GXBUS	OPEN DATA ECO-SYSTEM INITIATIVES, THAT ENABLES THE CREATION NEW APPLICATION SERVICES. A MOBILE APPLICATION THAT PROVIDES INFORMATION ABOUT PUBLIC TRANSPORT			http://www.icities4greengrowth.in/casestudy/open-data-gxbus-montevideo-uruguay	1					
11	BAHAMAS, THE	1	NASSAU	THE SUSTAINABLE NASSAU ACTION PLAN	FOCUS ON: GREENING NEW PROVIDENCE, RENEWING AND CONSERVING ENERGY, IMPLEMENTING A ZERO WASTE PLAN, CREATING A HEALTHY CITY, CONNECTING NASSAU DIGITALLY, URBAN REGENERATION, SMART CITY MONITORING, URBAN PLANNING FOR SUSTAINABILITY, LOCAL GOVERNMENT AND AN EMPOWERED PEOPLE.			https://thenassauguardian.com/2018/02/02/implementation-of-idbs-sustainable-nassau-action-plan-could-cost-450-mil/	1		1	1		
12	PUERTO RICO	1	BARCELONETA	TECHNOLOGICAL POLE	INVESTMENT IN TECHNOLOGY-ORIENTED BUSINESSES, THUS IT CONCENTRATES ONE OF THE LARGEST AND MOST IMPORTANT HUBS FOR PHARMACEUTICALS AND BIOTECHNOLOGY PROCESSES IN THE REGION.			http://www.intelligentcommunity.org/barceloneta_puerto_rico	1					

Table 10. Urban Innovation in Latin America and the Caribbean.

CODE	COUNTRY	% URBAN POPULATION IN SLUMS 2014	ICT AT HOME 2016	% USING INTERNET 2015	ACCESS TO IMPROVED WATER. URBAN AREA 2015	ACCESS TO PIPED WATER % 2015	ACCESS TO SANITATION FACILITIES % 2014	WASTE KG/PERSON/YEAR	SAFETY FEELING AT NIGHT %	ENERGY PRODUCTION BILLION KW/H 2014
ARG	ARGENTINA	16.7	63.8	69	99.0	98.1	96	341.4	39	141.3
BHS	BAHAMAS		66	78	98.4		92			
BRB	BARBADOS		67.7	76	99.7	98.4	96			
BLZ	BELIZE	10.8	30.2	42	98.9	89.4	91	403.4		
BOL	BOLIVIA	43.5	26.6	45	96.7	96.1	50	178.9	41	8.8
CHL	CHILE	9	61.1	64	99.7	99.7	99	456.3	48	5665.7
COL	COLOMBIA	13.1	45.8	56	96.8	94.1	81	226.3	45	69.9
CRI	COSTA RICA	5.5	60.2	60	99.6	99.6	95	321.2	48	10.2
CUB	CUBA		7.5	37	96.4	83.3	93	294.8		19.4
DOM	DOMINICAN REPUBLIC	12.1	26.2	54	85.4	75.8	84	375.9	33	18.6
ECU	ECUADOR	36	36	49	93.4	92.8	85	259.2	52	24.3
SLV	EL SALVADOR	29	16.9	27	97.5	97.4	75	324.9	47	6.2
GTM	GUATEMALA	34.5	20.5	27	98.4	75.8	64	222.7		10.7
GUY	GUYANA	33.1	28.2	38	98.2	97.4	84	558.5	59	
HTI	HAITI	74.4	4.7	12	64.9	13.3	28	251.9	42	1
HND	HONDURAS	27.5	24.6	20	97.4	90.2	83	222.7		8
JAM	JAMAICA	60.5	36.7	42	97.5	95.9	82	259.2	46	4.1
MEX	MEXICO	11.1	47	57	97.2	91.4	85	343.1	54	301.5
NIC	NICARAGUA	46	16.2	20	99.3	96.8	68	241	46	4.4
PAN	PANAMA	25.8	53.9	51	97.7	86.4	75	445.3	44	9.3
PRY	PARAGUAY	18	26	48	100.0	92.9	89	343.1	49	55.3
PER	PERÚ	34.2	26.4	41	91.4		76	273.8		45.5
PRI	PUERTO RICO		57.6	79		87.9	99		28	
SUR	SURINAM	7.3	42.4	43	98.1	76.9	79	496.4		2.2
TTO	TRINIDAD AND TOBAGO	24.7	70.9	69	95.1	83.5	92	660.7		9.9
URY	URUGUAY	6	61.8	65	100.0	100.0	96	376	48	13
VEN	VENEZUELA	32	34	62	95.0	90.3	94	313.9	12	127.7

Table 11. Urban services in Latin America and the Caribbean.

NO	REGION	CITY	TYPE	NAME	LOCATION	ADDRESS	WEBSITE
1	LIMA	LIMA	SUPERNODE	FAB LAB LIMA		JIRÓN NATALIO SANCHEZ 181, CERCADO DE LIMA	fablablima.org
2	LIMA	LIMA	SUPERNODE	LIMA MAKERS WORKSHOP	UNIVERSIDAD SAN MARTIN DE PORRES - FACULTY OF ENGEENERING	EL CARMEN 249, SURQUILLO	www.limamakers.com
3	LIMA	LIMA	MINI FAB LAB	FAB LAB USMP		AV. LA FONTANA 1250, LA MOLINA	www.usmp.edu.pe/ffia/index.php
4	LIMA	LIMA	FAB LAB	FAB LAB ATIKUX	GRADUATE SCHOOL OF BUSINESS	CALLE GENERAL RECAVARREN 435, MIRAFLORES	
5	LIMA	LIMA	FAB LAB	FAB LAB ESAN		UNIVERSIDAD ESAN, ALONSO DE MOLINA 1652, SANTIAGO DE SURCO	
6	LIMA	LIMA	FAB LAB	FURNITURE LAB	COLEGIO FRANKLIN DELANO ROOSEVELT	AV. SAN MARTIN, MZ 18 L10 URBANIZACIÓN BUENOS AIRES DE VILLA, CHORRILLOS	www.ifurniture.pe/
7	LIMA	LIMA	FAB LAB	FDR FAB LAB		AV. LA PALMERAS 325 CAMACHO, LA MOLINA	www.amersol.edu.pe
8	LIMA	LIMA	FAB LAB	FAB XPERIENCE CAFÉ	UNVERSIDAD DE INGENIERIA Y TECNOLOGIA	AV. CONQUISTADORES 146 SAN ISIDRO	www.fab.pe
9	LIMA	LIMA	FAB LAB	FAB LAB UTEC		AV. MEDRANO SILVA 165 - QUEBRADA ARMENDÁRIZ	www.facebook.com/FAB-LAB-UTEC-198406373864785
10	LIMA	LIMA	FAB LAB	FAB LAB UNI	UNIVERSIDAD NACIONAL DE INGENIERIA_FACULTAD DE ARQUITECTURA	AV. TÚPAC AMARÚ 220 RÍMAC	www.fablabuni.edu.pe/
11	LIMA	LIMA	FAB LAB	FAB LAB UCAL	UNIVERSIDAD DE CIENCIAS Y ARTES DE AMERICA LATINA	AV. LA MOLINA 3755, LA MOLINA	
12	LIMA	LIMA	FAB LAB	FAB LAB TECSUP I+DE	INSTITUTO TECSUP	CASCANUECES 2221, SANTA ANITA	www.tecsup.edu.pe/i+de/index.php
13	JUNIN	HUANCAYO	FAB LAB	FABLAB UCONTINENTAL		AV SAN CARLOS 1980, HUANCAYO	ucontinental.edu.pe/fablab/

Table 12. Fab lab network in Perú.

REF	DISTRICT	URBAN AREA KM2	POPULATION 2015	GREEN AREA M2/INHAB
1	ANCON	10.97	39 600	8.9
2	ATE	43.6	630 085	2.9
3	BARRANCO	2.42	29 984	8.9
4	BREÑA	3.21	75 925	0.7
5	CARABAYLLO	30.5	353 489	3.5
6	CERCADO DE LIMA	21.62	271 814	4.6
7	CHACLACAYO	8.46	43 428	4.5
8	CHORRILLOS	30.33	325 547	2.1
9	CIENEGUILLA	16.84	47 080	3.3
10	COMAS	33.63	524 894	3.9
11	EL AGUSTINO	12.15	191 364	3.5
12	INDEPENDENCIA	9.88	301 978	1.2
13	JESUS MARIA	4.35	71 589	9
14	LA MOLINA	29.5	71 646	10.3
15	LA VICTORIA	9.08	171 779	3.2
16	LINCE	2.75	50 228	3.3
17	LOS OLIVOS	18.26	371 229	5.1
18	LURIGANCHO	56.79	218 976	1.1
19	LURIN	36.66	85 132	4.5
20	MAGDALENA DEL MAR	3.06	54 656	4.6
21	MIRAFLORES	8.46	81 932	13.6
22	PACHACAMAC	19.08	129 653	0.7
23	PUCUSANA	3.59	17 044	1.4

REF	DISTRICT	URBAN AREA KM2	POPULATION 2015	GREEN AREA M2/INHAB
24	PUEBLO LIBRE	4.61	76 114	4
25	PUENTE PIEDRA	31.56	216 822	1.3
26	PUNTA HERMOSA	2.97	7 609	27.7
27	PUNTA NEGRA	3.57	7 934	17.9
28	RIMAC	9.02	164 911	2.1
29	SAN BARTOLO	2.72	7 699	9.8
30	SAN BORJA	10.29	111 928	12.4
31	SAN ISIDRO	9.72	54 206	18.2
32	SAN JUAN DE LURIGANCHO	56.87	1 091 303	1.9
33	SAN JUAN DE MIRAFLORES	26.1	404 001	2.3
34	SAN LUIS	3.49	57 600	5.9
35	SAN MARTIN DE PORRES	32.66	700 178	2.2
36	SAN MIGUEL	9.73	135 506	12.6
37	SANTA ANITA	10.3	228 422	3.3
38	SANTA MARIA DEL MAR	0.65	1 608	23.8
39	SANTA ROSA	4.3	18 751	4.3
40	SANTIAGO DE SURCO	29.13	344 242	5
41	SURQUILLO	4.62	91 346	3
42	V EL SALVADOR	34.05	463 014	5.5
43	V M DEL TRIUNFO	27.38	448 545	1.2

■ INEI
■ PLAM 2035

Table 13. Districts of Lima.

TYPE	NAME	SPONSOR	FOCUS	WEBSITE
PUBLIC	LAVICTORIALAB	INTERCORP	Design Thinking	www.lavictoria.pe/
	LABENTANA	INTERBANK	Design Thinking	
		BBVA		
		SCOTIABANK		
	APORTA	GRUPO BRECA	Design Thinking	www.aporta.org.pe
	LATINALAB	FRECUENCIA LATINA		
	MINEDULAB	MINISTRY OF EDUCATION	EDUCATION	www.minedu.gob.pe/minedulab/
	LAB51+	COUNCIL OF MINISTERS	IMPROVE GOVERNMENT SYSTEM PROCESSES	
	AYNI LAB-SOCIAL	MINISTRY OF DEVELOPMENT AND SOCIAL INCLUSION	IMPROVE THE QUALITY OF LIFE OF PEOPLE IN POVERTY OR VULNERABILITY	www.midis.gob.pe/index.php/es/ayni-lab-social
PRIVATE	SAP NEXT-GEN LAB ULIMA	UNIVERSIDAD DE LIMA	CONNECT STUDENTS, COMPANIES, ACADEMICS, STARTUPS AND ASSOCIATED OF SAP UNIVERSITY ALLIANCES	www.sapnextgenlab.fis.ulima.edu.pe
PRIVATE	ILABUP	UNIVERSIDAD DEL PACIFICO	DESIGN THINKING TO PROMOTE ENTERPRENEURSHIP	www.emprendeup.pe/ilab/
PUBLIC	LAB SAN ISIDRO	MUNICIPALITY OF SAN ISIDRO	TO PROMOTE THE INNOVATION AND TECHNOLOGIES IN SOCIETY	

Table 14. Innovation Lab in Lima.