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Technological Intelligence in Small Cities

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Abstract. The need for the benefits of innovation to permeate mainly towards the less advantaged sectors of the population has directed attention towards small cities or towns in transition towards sustainability. The aim of this research is to enable small cities to manage their assets efficiently, investing in socio-technological innovation and creativity as a way to promote sustainable and inclusive development. A methodological guide for the development of energy and water management strategies allows small cities to provide intelligence by efficiently appropriating available technologies aimed at improving the quality of life of the population, which necessarily leads to greater care for the environment and the reduction of social inequality. Towns or small cities must offer smart solutions to the challenges of contemporary urban and rural life, solutions that improve the quality of life of their citizens and the economic viability of the city. Therefore, it is not enough to apply modern Information Communications Technology ICT to towns to make them smart. Efforts should extend to improving the ability of a given people to attract and advance their own innovation potential.

Keywords: Transition to sustainability. Sustainable development. Small Smart Cities. Technological and Inclusive Innovation. Technological intelligence.

1 Introduction

Today, more than 50 per cent of the world's population lives in urban areas, and this figure has been increasing significantly, taking into account that only 34 per cent of the world's population lived in urban areas in 1960. This is already known in Western Europe, where approximately 80% of the population will live in urban areas by 2020.

This reality gives cities a new commitment. How do they become more innovative, participatory, connected urban spaces with sustainable places without neglecting the quality of life of the populations?

The answer can be translated into several denominations, among which are: smart and/or sustainable cities; new technology communities; etc.

One thing is for sure, the intention that underlies any of these situations is to make the city a community that can be friendly in the village and for the village. The concept

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of "smart cities" has come to dominate both fields, both academic literature and public policy. Several projects around the world are being conceived and implemented, with different characteristics, motivations, levels of maturity, governance models and funding sources. However, the goal has always been the use of information and communication technologies for a simpler urban life.

However, how can we define a Smart City? The International Data Corporation defines a Smart City as a city that has declared its intention to use information and communication technologies to transform its modus ope-randi into one or more of the following areas: energy; environment; governance; mobility, buildings and services. The main objective of a Smart City is to improve the quality of life of its citizens by guaranteeing sustainable economic growth (Lopes, I.M, Olveira, P, 2017). This growth implies a growing demand for resources for buildings and infrastructure in urban areas. The term "Smart City" was developed only very recently. One approach to exact definition and optimal interpretation is "intelligent development." although what "smart" means to the city and its inhabitants is controversial. Each smart city design has a different approach to what "smart" or "smarter city" means and how to proceed with its specific development (Maier, 2016).

Increasing urbanization generates enormous challenges for contemporary cities, mainly that of economic efficiency and environmental sustainability. Smart city initiatives are aimed at solving these major challenges through the use of technologies and innovation, and are an opportunity for cities to rethink the way they provide their services to citizens. According to the European Parliament, smart cities can be identified and classified according to six main axes or dimensions: smart governance, smart economy, smart mobility, smart environment, smart people, and, finally, smart living. Therefore, a city can be defined as "smart" when investments in human and social capital and in transport and ICT infrastructures contribute to sustainable economic development and improve the quality of life, with a rational management of natural resources, through participatory government (Villarejo, 2015).

In short, increasing urbanization presents innumerable challenges for local governments that must develop their policies for the future taking into account the increasing number of urban inhabitants. Sustainable urbanization requires cities to generate better income and employment opportunities, expand the infrastructure needed for water and sanitation, energy, transport, information and communications; ensure equal access to services; reducing the number of people living in slums; and preserve natural assets within the city and its surroundings (United Nations, 2015).

In general terms, the concept of smart and sustainable cities or territories refers to an extensive and efficient use of technologies available in particular ICTs aimed at improving the quality of life of the population, which should inevitably lead to greater care for the environment and the reduction of social inequality. This is compatible with the concept of inclusive innovation, which roughly raises the need for innovation

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benefits to permeate mainly towards the less favored sectors of the population (Alvarado, 2017).

According to Givens, J.W and Lam, D. (2018) research for development in smart cities has been growing rapidly. Smart cities promise a new era of efficient, sustainable and safe living. The tools and technologies aimed at driving better public decision-making in everything, from where we live to how we work. While the world is rapidly urbanizing, a large percentage of the population still lives in smaller, rural communities. Smart City solutions as defined here are process-driven and not limited by population or geography metrics; are the application of technology and data available to improve the quality of life. Smaller communities can also be smart, and excluding or ignoring them widens inequality, limits use cases, and slows innovation.

1.1 Intelligence for small cities

The development of a smart city is an iterative process in which cities are constantly improving their efforts to apply appropriate technologies and data. This fits very well within other results-oriented city frameworks, such as sustainable development or resilience. For example, the UN Brundtland report (1987) defines sustainability in terms of meeting the needs of current generations without endangering future generations. Smart cities can be the means to achieve sustainable development, providing the technology to achieve the goals and the data to measure whether they have been met.

Although little attention has been paid to the potential of small cities to become smarter, the definition of smart cities does not exclude the possibility. Indeed, there are almost no references to populations, sizes, densities or minimum urbanities in almost any of the definitions of smart cities. In fact, these definitions allow intelligent solutions at any scale, from people who have technology and data to improve their daily decision-making, to neighbors who meet through their community associations to address cleaning or block surveillance tasks, to regional networks that include large metropolitan areas and even, extensions across national borders.

Universities, similar in size and scale to many small cities, have become natural testing grounds for smart solutions. They have operational control and ownership over many city-like functions, from transportation to infrastructure. They also have substantial advantages over most small cities, including resources, expertise, and streamlined governance. According to Givens, J.W and Lam, D. (2018) to meet sustainability and energy goals, some universities have developed high-performance buildings and created the space to welcome the development of autonomous vehicles, such as Mcity from the University of Michigan. The success of these initiatives demonstrates the potential of smart solutions for smaller cities, but also the challenges that most such cities will face, as they lay far behind universities, especially in terms of resources, initiative, and expertise.

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Local governments of all sizes have degrees of autonomy and independence to develop their smart community, but their needs and priorities are very different from those of an urban metropolis.

As evidenced above, the Smart concept covers large cities and some of its efforts that focus on small towns have been developed in universities, but it is true that there are many small municipalities far from large cities that seek to take advantage of technological innovations for the benefit of their citizens and the environment.

1.2 Small Smart Cities

The generation of research projects aimed at the development of Small Smart Cities raise the need for the benefits of innovation to permeate mainly towards the less favored sectors of the population, in which unmet basic needs such as access to basic services such as electricity and drinking water are still detected.

To date, research on smart cities has focused primarily on urban congested areas. It is increasingly important to consider intermediate and sparsely populated regions, such as towns and rural areas, as spaces for digital innovation (Hosseini et al. 2018).

In a world of ever-changing (corporate) environments, disruptive digital technologies and very diverse citizen needs, the concept of smart cities has become a widely discussed topic (Hollands 2008). In general, smart cities are seen as a promising response to the urgent challenges of the twenty-first century, such as air pollution, immigration and sociodemographic problems (Klein et al., 2017). The penetration of smart cities thanks to digital technologies gives this generation the unprecedented opportunity to fundamentally reorganize urban infrastructures, whether transport or food and water supply, in much smarter ways (Ramaswami et al., 2016). Consequently, the use of modern information and communication technologies (ICTs) fosters people's exchange and connection, which can provide multiple opportunities for innovative business models (Schaffers et al., 2011).

According to the European Union's statistics office, urban areas can bepresentedby the so-called degree of urbanisation (DEGURBA) which divides urban areas into cities (densely populated areas), towns and suburbs (areas of intermediate nature), and rural areas (sparsely populated areas) (Eurostat 2017). Until now, research on smart cities and smart solutions has focused predominantly on densely populated areas, leaving behind towns, suburbs, and rural areas. Roberts et al. (2017, p.372) note that "digital technology remains a niche topic in rural studies."

In addition, research on rural areas and development takes a strong agricultural focus and hardly considers digital technologies from an overall community and business

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perspective (Roberts et al., 2017). Low levels of research and development in predominantly rural areas (To¨dtling and Trippl 2005) aggravate this problem, although digital technologies and smart solutions could provide promising solutions for the future development of towns (Roberts et al., 2017).

However, recent literature even highlights the paramount importance of smart strategies and innovation in rural areas (Provenzano et al., 2016). This new focus on the social periphery is becoming increasingly important, for example, a significant proportion of the European Union's population lives in sparsely populated areas (in what are known as villages). According to DEGURBA, 28% of European residents live in these sparsely populated areas (Eurostat 2017). As Porter et al. (2004) claim that these peoples have enormous economic potential, although the gap between sparsely populated and densely populated areas is widening. Other studies have revealed that the recent success of populist candidates in democratic elections can be attributed, at least in part, to determining factors such as economic distress (Rothwell and Diego-Rosell 2016; Monnat 2016), as there is a quantifiable relationship between personal economic well-being and election results (Glasgow and Weber 2005).

Importantly, policy and research should not only consider the challenges and problems of large-scale smart cities. According to DEGURBA, one fifth of the German population lives in sparsely populated areas. This corresponds to a total of 17 million people (Eurostat 2017). A wide range of public (research) projects has illustrated the importance of digital innovations in regions where residents are more spatially dispersed. Exemplary research projects include "Smart Rural Areas" (Hess et al., 2015) or the Living Lab initiatives (Schaffers et al., 2011). However, it is worth noting that rural areas differ from cities in terms of their specific characteristics, challenges and problems. These include (but are not limited to) significantly reduced amounts of research and development, as well as the consequent grievances of little or no innovation, underdeveloped industries, missing knowledge providers, and almost no innovation assistance from administrations (To¨dtling and Trippl 2005). Moreover, when looking at the digital policy agenda, rural areas tend to be more "passive and static, in contrast to the mobility of urban, technological and globalization processes" (Roberts et al. 2017, p.372). Several "domains such as teleworking, health services, logistics, mobility, agriculture, trade or education" (Hess et al., 2015, p.164) are plagued by these problems. Therefore, our definition of smart village refers to Giffinger et al. (2007) as a rural village or area that is intermediate or sparsely populated but provides adequate and future-oriented ICT solutions to improve various domains related to economy, people, governance, mobility, environment or life.

Of course, peoples require innovation to harness the potential of digitalization. However, like cities, villages also face a complex range of specific local challenges based on their various characteristics, such as geographical, economic, social and ecological conditions. Neirotti et al. (2014) summarize such variables as factors of local context that are crucial for the development of all types of urban areas. However, solutions based on innovative digital technologies are discussed in the broad context of

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smart cities, which means that they do not necessarily fit the requirements of cities. Hess et al. (2015) argue that villages, compared to smart cities, have their own challenges in the future since, for example, they do not have a wide availability of infrastructure services that bring individual challenges to different application domains such as logistics, mobility or education, therefore, the context must be understood. In addition, unlike villages, cities exhibit more complex structures in terms of the number of different stakeholders from various domains who must participate in smart projects (Nam and Pardo 2011). But, once again, cities can better take advantage of economies of scale and multiple business model opportunities thanks to the connection of many participants and stakeholders (Schaffers et al., 2011), while villages are characterized by smaller sizes and more dispersed populations.

Smart villages must offer smart solutions to the challenges of contemporary urban and rural life, solutions that improve the quality of life of their citizens and the economic viability of the city. Therefore, it is not enough to apply modern ICTs to people to make them smart. Efforts should extend to improving the ability of a given people to attract and advance their own innovation potential (Hosseini et al. 2018).

2 Technical Intelligence for the transformation of the city

2.1 Methodological proposal for the integration of green technologies creating Small Smart Cities

The development of this methodology allows those responsible for the management of small cities to consider the need to evolve towards an efficient and sustainable city with technological intelligence that promotes the characteristics of each city, creating quality services for the intelligent management of water and energy.

Success lies in cooperation between the authorities and all economic and social actors, with crucial involvement of citizens. In this way, sustainability theories can become realities (Madrid Network et al. 2012).

A good part of the interest that a city arouses depends on how attractive its natural and environmental conditions are, both the urban environment itself, and the immediate environment that surrounds them. The intrinsic characteristics of a city influence the citizen when assessing its environmental attractiveness, although these may not be enough if there is no efficient management behind it. In this context, the strategy of a Smart City will be effective by assuming the intrinsic characteristics of a territory, trying to enhance its environmental attractions and mitigating or neutralizing its weaknesses, through appropriate management and environmental protection measures (Bentué, 2016).

Development is a double-edged sword. Poverty reduction, economic development and the construction of more egalitarian societies are collective achievements that in turn entail new and greater environmental and social challenges and therefore the need

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to reconcile the various objectives of development to keep us on the path of sustainable development. The success of economic growth requires realizing the potential that ecosystems have to meet the demands for water and energy that are essential for life and for the production and consumption processes in which water and energy intervene as non-replicable inputs (UN, 2014).

Considering together the challenges of water and energyrepresents a unique opportunity to create alogo in favour of the preservation of the environment to guarantee these services. A transition from the use of non-renewable resources to a greater use of renewable resources is necessary, from supply-only policies to policies to improve the use and management of available resources and from a policy of infrastructure construction to one where there is a better balance of infrastructures and conservation of ecosystems that allow the production of water and energy services to continue (UN, 2014).

The methodology contemplates 4 fundamental principles that guide the elaboration of the strategy to be developed, which are:

1. Human approach: Quality of life is prioritized, and the center of action is prioritized on people and the experience of good living.
2. Participatory city: Decision-making integrates the opinions and aspirations of representative actors of society, through instances of effective and binding participation.
3. Territorial intelligence: Strategies adaptable to each territory.
4. Promotion of the right to the city: Inclusive city with equality for all and access to the benefits it offers.

The methodological structure develops in 4 phases and the components are detailed below:

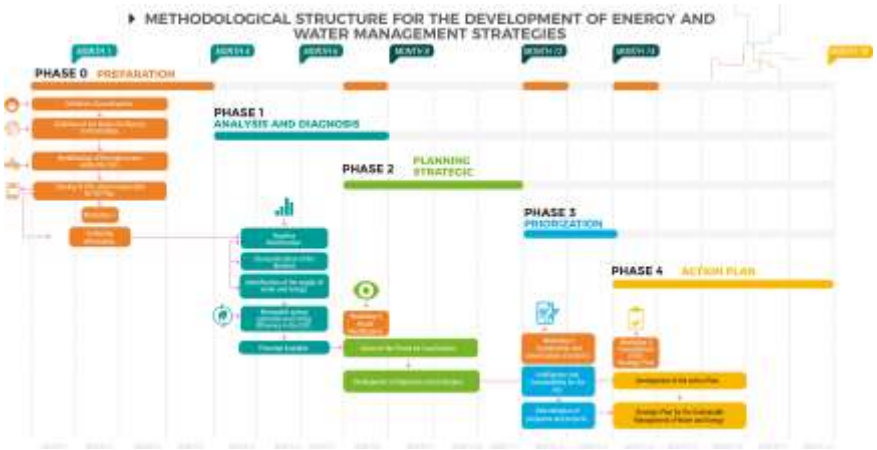

Fig. 1. Process diagram of the Methodological Structure
Source: self-made.

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Phase 0. Preparation

Definition of participation:

The person in charge of the city and the participating officials must be defined: Identification of the roles and responsibilities of the officials who will participate in the elaboration of the Strategic Plan.

Definition of the limits of influence in the territory

The territorial limit of the SSC (intervention area) must be demarcated, as well as the most relevant sectors from the point of view of supply and demand of energy services and water management, establishing a baseline of the city through a comprehensive diagnosis of the SSC's scope of action.

Identification of the main actors within an SSC

A map of the actors is prepared, making contact with each institution that can provide the necessary information for the initial diagnosis (base line). To establish contacts, the support of the city is required.

It is important to identify the actors that play a role in the development and subsequent implementation of the plan. These will vary depending on the type of city, its geographical location and size, among others.

Training for SSC stakeholders responsible for developing the plan and other relevant stakeholders

In order to present the stakeholder participation process, workshops are held to collect opinions from key SSC stakeholders.

Phase 1. Analysis and diagnosis

Baseline Identification

Demand characterization: Energy and water demand indicators by sector are obtained from the information provided by the identified stakeholders. The accuracy of the diagnosis will depend on the quantity and quality of the information available. The demand for total energy (electricity and fuel) and water in the city in the public, residential and private sectors is estimated. The analysis of the current situation is what serves as a baseline.

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Identification of the energy and water supply: The energy and water supply indicators are obtained from the information provided by the identified actors. The accuracy of the diagnosis will depend on the quantity and quality of the information available.

At this point, the city's energy system and water production system are described, from energy generation to its distribution to end users, and in the case of water from natural supplies, passing through the treatment plants and finally to end users.

Renewable energy potential and energy efficiency in the SSC

The potential for energy generation and water production based on local renewable sources such as solar, wind, biomass, geothermal and hydro-electric energy is calculated. At this point, the potential of the different sources of Renewable Energy (RE) and Energy Efficiency (EE) is estimated.

Future vision for local action

Development of objectives and strategies, measurable and verifiable. The city must establish measurable objectives and aiming at quality, while the strategies must be realistic and achievable, consistent with the current situation, in observance of the available potential. Goals and objectives must be aligned or not in opposition to objectives established at the national level. The strategies to be developed within the methodology should be oriented at least to the following points:

- Optimization of the use of electricity, fuels and water (energy efficiency, efficient water consumption).
- Generation of electricity and water supply based on renewable natural resources existing in the territory.
- Reduction of greenhouse gas emissions.

A Small Smart City - SSC proposes an integrated approach where technology improves the efficiency of the city's operations, the quality of life of its citizens and the growth of the local economy through the development of energy and water management estates while maintaining the balance of infrastructures and conservation of ecosystems.

According to Maciá (2016)*"The Smart Environment field focuses on the use of Green IT (Green Computing and Information Technology) to develop an intelligent environment, capable of optimizing natural resources, preserving and protecting the environment, reducing gases and waste in a sustainable way, and of controlling and rationalizing energy consumption*", this area allows generating strategies to convert the project of an SSC into opportunities for citizens, private companies and public entities.

To achieve the desired objectives, Smart Environment focuses on the following areas to which we can provide intelligence from IT solutions:

Energy (SmartGrid) . Consumo and energy efficiency
Water (SmartWater) . Control, management and optimization of water.

In short, the urban scale of a small city is ideal to promote a sector of eco-technological urban solutions, bringing together the private initiative with the public and civil society, promoting pilot projects of territorial development and urban, social, economic and environmentalrehabilitation. The needs of creation, renovation and maintenance of infrastructures and services that this growth will generate can end up becoming an extraordinary destructive force for the planet if they are not addressed from a design from the beginning of the villages, an intelligent urban design combined with the sensible application of clean technologies. If we combine new ways of life and consumption habits, with intelligent urban design and with the application of green technologies for sustainable development, we can build a new generation of intelligent infrastructures and services. To provide intelligence to small cities, some transversal axes characteristic of a Smart City must be integrated, which are detailed below:

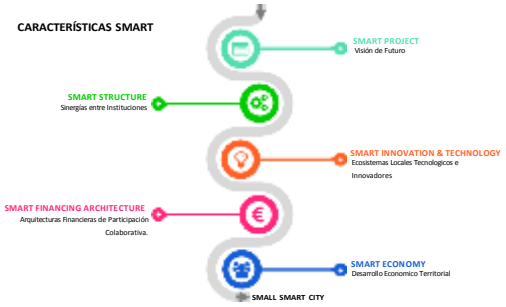

Fig. 2. Characteristics of an SSC.
Source: self-made.

Smart Project. Vision of the future in a small city that allows the design and territorial development based on an integral urban regeneration in aspects such as energy technologies and drinking water production as a commitment to the Small Smart City with a vision of the future. Permanent process of creation, maintenance and improvement of living conditions and basic structures in order to enable all human beings to well-being within the limits of ecosystems (Sustainable Development Summit, Madrid 2006). The ultimate goal is to achieve the "sustainable city", a city whose economic, social and ecological components are harmoniously associated.

Smart Structure. Synergies between institutions, citizens and the private sector in order to generate integrated governance models through Smart City projects, sustainable development and transformation of city into green city, with sustainable

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strategies linked to the territory, produce progress and well-being for citizens. Carrying out a city project with the scope and approach proposed here requires an intelligent structure of **leadership, momentum and management.** Leadership at the local level is increasingly relevant for the growth of territorial innovation ecosystems, open and collaborative, which facilitate, encourage and promote the physical and knowledge infrastructures that constitute it as an intelligent, effective and attractive territory, and make the difference of the city as a place conducive to investment and the development of innovative economic activities.

Smart Innovation & Technology. Local ecosystems where collaboration between industry, government organizations and citizens allows to create a new generation in which the application and appropriation of ICTs generates sustainable development and spaces, where technological innovation is also social innovation. Innovation is the only strategy that ensures long-term sustainability, responding to the challenges of socio-economic development at the scale of the territory and promoting a greener and more sustainable economy.

Smart Financing Architecture. Financial architectures with formulas of public-private participation and innovative public procurement to generate economic sustainability. Public Private Partnerships (PPPs) are of particular interest to Smart City projects as it allows risks and benefits to be shared. CPP contracts are a tool that guarantees the execution and exploitation of projects while ensuring the private sector involved in them a competitive economic return. In addition, they favor innovation and allow accelerating the development of new services, of higher quality and with a greater social impact.

Smart Economy. New high-value economic activity based on innovation and clean technologies in the transition to the green economy. Develop a territorial economy to promote and strengthen economic development processes at the territorial level, with a focus on human development, that is, development with economic efficiency, inclusive, equitable and sustainable character. Generate national policies, territorial economic development strategies, promoting the creation and operation of Local Economic Development Agencies.

Smart Environment Areas **Characteristics Smart**	***Smart Water***	***Smart Grid***
Smart Project	Pilot projects for territorial development and infrastructure regeneration for water and energy, combining smart urban and rural design with the judicious application of clean technologies.	
Smart Structure	Institutional agreements and/or governance models of a public and private nature between academia, business, state and society. Construction of a city project that includes active citizen participation in the structuring and validation of the project as the main beneficiary of the actions to be implemented.	

	Inclusion of public policies that allow the management of investment projects that directly benefit the community individually and collectively, turning them into generators of water and energy; allowing self-sufficiency, awareness of use, thus reducing CO2 emissions.
Smart Innovation & Technology	Integration of green technologies in the creation of intelligent solutions appropriate to the specific needs of the city. Creation of open knowledge networks for the diffusion and transfer in search of the replication of intelligent solutions in the other small cities of the world. Use and appropriation of clean and innovative technologies by citizens
Smart Financing Architecture	Strategies for public-private collaboration to generate economic sustainability for innovation projects to create small smart cities that ensure a competitive economic return for the private sector involved and promote innovation by creating new, quality services with a greater social impact.
Smart Economy	Creation of new high-value economic activity, based on innovation and technology. The green economy as a response to the global economic, social and financial crises through the redistribution of natural, social and financial capital in order to generate benefits for economic development, social equity and environmental protection. The market for clean technologies with high energy efficiency and low carbon emissions as a commitment to the development of a territorial economy in order for companies, markets and investors to bet on sustainable development that allows guaranteeing long-term profitability and promoting local businesses.

Table 1. SSC´s Characteristics.
Source: self-made.

Phase 3. Prioritization

Intelligence and sustainability for the city

Specific programs and projects are determined based on the diagnosis of the current situation and the available potential of renewable energy, energy efficiency and water potential. This phase must be developed in conjunction with the city's key stakeholders for the identification of specific projects and for their evaluation and prioritization. Each project should contain a brief description and information on costs, benefits, impacts and those responsible.

Phase 4. Action plan

Guide to Action

This phase comprises the identification, development, and selection of strategies and/or actions for the prioritized areas in Phase 3. The implementing technical team works closely with the city counterpart team, obtaining technical depth and a strong sense of commitment of each entity. In this phase, a more detailed analysis of the prioritized areas is carried out, recognizing opportunities and risks to improve the current situation of each of them, as well as identifying the sources of financing and the responsible actors that will make implementation possible. of the defined interventions.

The city/technical teams create an Action Plan to schedule the execution of each identified intervention. Each defined project must have its respective financial structure, schedule, responsible parties, cost estimates for pre-investment studies and investment costs, as well as possible sources of financing. The Action Plan must consider a short and medium-term stage, within which the administration has the resources and leadership to initiate specific actions and carry them out within its administrative period, considering the political variables, generation of results and monitoring. However, these actions are aimed at achieving long-term goals that must be met by the next city administrations. This Action Plan constitutes the navigation chart of the city on its path towards sustainability.

<table>
<tr><th>CHARACTERISTICS SMART</th><th>Smart Water</th><th>Smart Grid</th></tr>
<tr><td rowspan="4">Smart Project</td><td colspan="2">STRATETIC LINE 1. TERRITORIAL DESIGN AND DEVELOPMENT</td></tr>
<tr><td colspan="2">SL 1. Formulate and implement pilot projects for territorial development and infrastructure regeneration for water and energy, combining intelligent urban and rural design with the judicious application of clean technologies.</td></tr>
<tr><td>SA 1.1. Reconstruction of the existing infrastructure for water with an eco-sustainable approach and the inclusion of clean energy. New infrastructure projects based on green technologies and innovation, and scale solutions.</td><td>SA 1.2 Energy and sustainable infrastructure projects supported by generation systems from renewable sources, both collective and individual energy efficiency strategies for each citizen.</td></tr>
<tr><td colspan="2">SA 1.3 Bidirectional platforms that facilitate access to new services and solutions that make life easier and more comfortable for citizens, a platform on which to deploy a wide variety of products and services in areas such as energy efficiency and smart management energy and water, water collection and treatment, as well as business opportunities in the energy sector, new technologies, water, new materials, among others. A platform that allows the government to provide its services more efficiently and at a lower cost, making these new services and more communication and social participation options available to citizens.</td></tr>
<tr><td rowspan="8">Smart Structure</td><td colspan="2">STRATEGIC LINE 2. SYNERGY BETWEEN INSTITUTIONS</td></tr>
<tr><td colspan="2">SL 2. Develop institutional agreements and/or governance models of a public and private nature between academia, business, state and society.</td></tr>
<tr><td colspan="2">SA 2.1. Inclusive and open governance processes building a multidirectional policy through an open innovation model.</td></tr>
<tr><td colspan="2">SA 2.2 Create intelligent leadership, impulse, and management structures. Leadership at the local level is increasingly relevant for the growth of territorial, open, and collaborative innovation ecosystems that facilitate, encourage, and promote the physical and knowledge infrastructures that constitute it as an intelligent, efficient and attractive territory, and mark the difference of the city as a favorable place for investment and the development of innovative economic activities.</td></tr>
<tr><td colspan="2">SA 2.3 Shared responsibility between citizens and interested parties (companies, universities, R&D centers, institutions and public bodies...) to solve the city's problems.</td></tr>
<tr><td colspan="2">STRATEGIC LINE 3. CITIZEN PARTICIPATION</td></tr>
<tr><td colspan="2">SL 3. Build a city project that includes the active participation of the citizenry in the structuring and validation of the project as the main beneficiary of the actions to be implemented.</td></tr>
<tr><td colspan="2">SA 3.1. Spaces and processes of a deliberative nature, requiring both the collaboration and interaction of a diversity of city agents as well as the creation and maintenance of dialogue spaces to share information, experiences and perspectives and generate shared visions. They are innovation processes that incorporate high doses of experimentation and open and collaborative construction of proposals for the city.</td></tr>
<tr><td colspan="2">SA 3.2 Technological platforms for two-way communication between citizens and the state to expose the needs of the city in real time, optimizing the response and action by the competent entities.</td></tr>
<tr><td colspan="2">STRATEGIC LINE 4. PRIVATE SECTOR</td></tr>
</table>

	SL 4. Inclusion of programs that allow the management of investment projects that individually and collectively benefit the community, turning them into generators of water and energy; allowing self-supply, awareness of use, thus reducing CO2 emissions.	
	SA 4.1 Implementation of drinking water generation systems from clean sources for each community, house, or establishment to be self-sufficient and control and reduce spending.	SA 4.2 Implementation of energy generation systems from renewable sources for each community, house, or establishment in order to be self-sufficient and ensuring energy consumption and efficiency.
Smart Innovation & Technology	**STRATEGIC LINE 5. ECO-TECHNOLOGICAL INNOVATION**	
	SL 5. Integration of green technologies in the creation of smart solutions appropriate to the specific needs of the city.	
	SA 5.1 Integrate suitable solutions and technologies with sensible and independent criteria, putting them at the service of a smart city project.	
	○ Drinking water generation system through hydropanels ○ Water treatment plants ○ Filtration systems for water sources ○ Mist trap systems ○ Collection of rainwater	○ Photovoltaic solar system for electricity generation ○ Bioenergy from biomass ○ Wind turbine system producing electrical energy. ○ Mini-hydraulic systems for small hydroelectric plants
	SA 5.2 Creation of knowledge and technological infrastructure, capable of using its own internal market as an experimental laboratory to test different business models, thus supporting the development of new advanced solutions, products and services by innovative local industry.	
	SA 5.3 Develop eco-technological solutions, as spaces for experimentation and demonstration at the service of innovation - LIVING LABS	
	SA 5.4 Creation of open knowledge networks for the diffusion and transfer in search of the replication of intelligent and eco-technological solutions in other small cities of the world.	
	SA 5.5 Use and appropriation of clean and innovative technologies by citizens	
	SA 5.6 Development of pilot projects on a real scale, demonstrative technologies aimed at achieving "low carbon" environments.	
Smart Financing Architecture	**STRATEGIC LINE 6. PUBLIC PRIVATE COLLABORATION**	
	SL 6. Strategies for public-private collaboration to generate economic sustainability for innovation projects to create small smart cities that ensure a competitive economic return for the private sector involved and favor innovation by creating new, quality services with a greater social impact.	
	SA 6.1 Implement operational programs in a transversal way and resort to financing from various funds, to guarantee the execution of an integrated strategy in a territory. The integration of funds generates a better result with the same amount of public investment, ensures the involvement of local agents and offers greater security with respect to financing to promoters, constituting it as an integrated territorial investment.	
	SA 6.2 Promote business innovation and finance R&D through the acquisition, by public entities, of innovative goods and services, which are introduced for the first time on the market as an innovative public purchase	
Smart Economy	**STRATEGIC LINE 7. INTELLIGENT, INNOVATIVE AND CREATIVE PERSPECTIVE.**	
	SL 7. Creation of new high-value economic activities based on innovation and technology.	
	SA 7.1 Promote new entrepreneurial activities in the field of the green economy through the redistribution of natural, social, and financial capital to generate benefits for economic development, social equity, and environmental protection.	
	SA 7.2 Development of a local economy focused on eco-efficiency, to achieve the transition towards social, economic, and environmental sustainability supported by the use of technology (ICTs) to improve the efficiency of city operations and promote guidelines responsible consumption.	
	SA 7.3 Promote the production of goods and services in a sustainable and responsible manner, both with the planet and with future generations, seeking to imitate the behavior of natural ecosystems, developing innovations inspired by nature itself, creating multiple benefits for all, as well as employment and social capital, get more with less (Blue Circular Economy).	

Table 2. Strategic actions to create SSC.
Source: self-made.

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The strategic lines and the intelligent actions to be implemented will make it possible to provide small cities with intelligence, solving existing problems and turning the city into an SSC through the execution of the projects, as shown in figure 3.

Figure 3. Projection of the SSC (Tecnicalia Adaptation)

3 Partial application of the methodology

As an example of the partial application of the methodology, in this case it applies only to the development of local energy strategies, specifically in the phase of Vision of the future for local action, formulation of the vision and objectives, it is described in summary the case of Vitacura - Chile.

Vision for Local Action: The Vitacura 30/30 initiative establishes the roadmap for the energy strategy of the commune of Vitacura for the year 2030. The vision was agreed internally with representatives of the Municipality of Vitacura. Specifically, it will be sought that by 2030 30% of the energy (electrical and thermal) consumed in the commune comes from clean and renewable sources. In addition, it will seek to reduce the energy consumption of all the actors belonging to the commune by 30%, taking 2013 consumption as a baseline. The objectives are grouped into three main themes: information, energy efficiency and renewable energy. Below is a summary of the vision with the objectives for the Vitacura commune.

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Fig. 4. Vitacura 30/30 Initiative
Source. Chilean Ministry of Energy

A second case of partial application of the methodology referring to providing intelligence to a city through the appropriation of one of its characteristics Smart Innovation & Technology, which integrates very diverse aspects related to the environment, resources, infrastructures , services, social and political behaviour, etc.; in order to progress in its social, economic and environmental sustainability with the use of technology (ICTs) to improve the efficiency of city operations, the quality of life of its citizens and the growth of the local economy.

This has been collected by the European Society for Innovation in Smart Cities and Communities in its Strategic Implementation Plan, which is specified below:

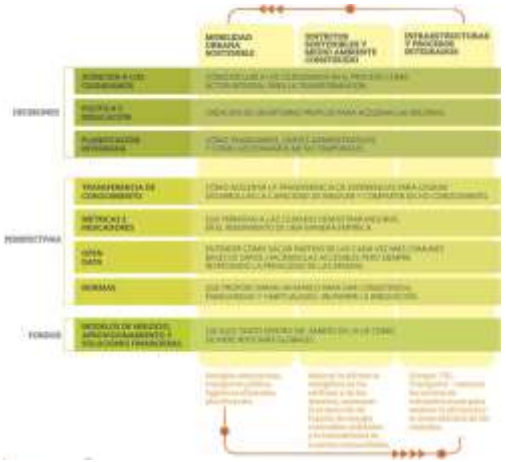

Fig. 5. Priority areas (European Innovation Partnership on Smart Cities and Communities: Strategic Implementation Plan
Source. http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf

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4 Conclusion

The modern human being, immersed in technology and the beauty of its versatility, has stopped looking at the past without knowing that it not only allows us to reflect on the future, but is also the reason for the evolution and existence of current technology. Therefore, it is not enough to apply modern ICTs to people to make them smart. Efforts should extend to improving the capacity of a people by appropriating their innovation capabilities.

The SSC will be a reference model to explain the interactions between the technological progress driven by the different digital vectors, the cultural change in the patterns of social behavior and industrial organization and the transformation of the management of public services. In this scenario of the appearance of innovations of different signs, both technical and institutional, we seek to establish a framework to understand in an organized and integral way a possible horizon to make the promises of personalization, optimization, adaptation in real time a reality... in the day-to-day functioning of public services and the decisions that organize and shape small cities.

It is a model that is part of a broader dynamic of change in any social sphere, from the economy and industrial development to social habits or the development of new practices of democratic deepening (Martín Patino, 2017). Thisresearch aims to shed light on the conceptual bases and their practical applications. The methodological proposal for the creation of Small Smart Cities allows to provide intelligence to small cities, solve their basic needs, guiding the action of companies, institutions and social organizations interested in contributing to urban and social development, reflecting on their deepest meanings, not only from the point of view of the digital transformation of the city, but also from its implications in society and in the aspiration to move towards cities on a human scale that offer quality of life to the population.

The SSC seeks to generate the city's own capacities, as indicated by Martin Pa-trino, 2017, transforming individual and collective capacities to intervene in public and private affairs in a different way, through fewer or new intermediaries that can potentially create new balances with power. The distribution and access to information, forms of collective organization, the creation of projects at local level or mediation in public debates. Collective action, self-organization or co-creation are rejuvenated dynamics of this condition of the connected city at street level, and foundational elements of approaches sensitive to the social and human elements of the transformative role of smart technology.

The SSC will be even smarter than the big cities since they will be built from the experience of the past and the reflection of the future, in search of the conservation of natural assets as an inheritance for future generations. The strategy of a Small Smart City will be made effective by assuming the intrinsic characteristics of a city, and

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strengthening them to their maximum potential, with a focus on building from its beginnings.

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