

## **Application of the Methodology for evaluation, identification and implementation of Smart Cities projects in Latin America and the Caribbean**

**Methodology document and user manual**

July 23th, 2021.

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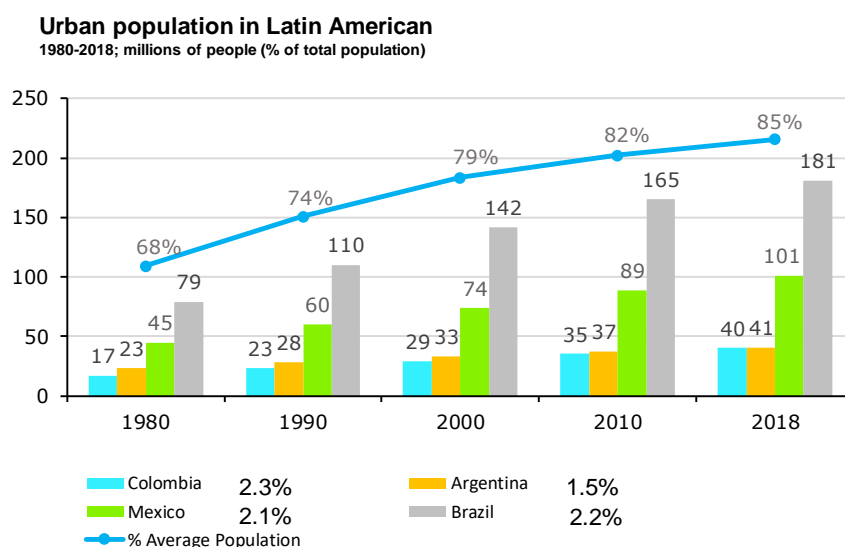
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# 1. Introduction and context

## 1.1. Context of Cities in Latin America and the Caribbean

Cities are development, growth and innovation centers in our society. In 2017, they hosted 57% of the world's population and 80% of the population in Latin America and the Caribbean<sup>1</sup>. Urbanization is expected to continue and by 2050, 68% of the world's population is expected to live in cities. However, for Latin America and the Caribbean, this figure adds up to 88%.



Source: Own elaboration based on World Bank data

Urbanization and rapid population growth pressured cities into growing sustainably and providing efficient, quality public services, which in turn challenged their capacities, planning and response mechanisms. Therefore, urban planning and the development of dynamic mechanisms that encourage the participation of citizens, private sector and government are becoming increasingly relevant.

Cities find in technology a way to increase the efficiency of these processes, service levels and access to public services, which allowed them to improve the quality of life of citizens and convert them into protagonists of the transformations of society. For example, the city of Buenos Aires has a mobile application where citizens can report on the city's problems: from street lighting to street problems. This allowed them to reduce demand response times by 93%<sup>2</sup>.

Therefore, more and more cities seek to incorporate technological elements into their planning and service delivery mechanisms, which has contributed to evolve them into smart cities. To better understand the concept of smart city, the Inter-American Development Bank (IDB) proposes the following:

*"A smart city is one that puts people at the center of development, incorporates information and communication technologies into urban management, and uses these elements as tools to stimulate the formation of an efficient government that includes collaborative planning and participation processes. By promoting integrated and sustainable development, smart cities become more innovative, competitive, attractive and resilient, thus improving lives."*

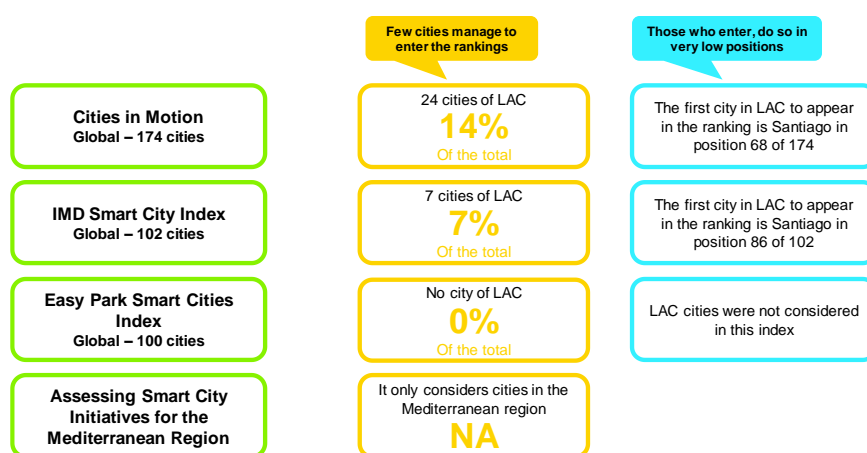
However, despite the positive impact that the development of these city models can have in Latin American cities when it comes to the challenges arising from their rapid growth, **there were no systematic or methodological processes that would allow to evaluate the level of smart maturity in cities under the Latin American context** (i.e., measurement schemes that take into account the reality and context of Latin American and Caribbean society). This makes it difficult for local

<sup>1</sup> Source: World Bank. <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>

<sup>2</sup> Source: Former Deloitte project.

governments to understand the efficiency level of application of technologies, identification of specific needs or even the comparison with other cities with similar characteristics and detect good practices to incorporate into their management models.

Although there are indexes and reference methodologies, these do not reflect the reality of Latin America and the Caribbean from their design. There were designed for the context of other regions with different challenges or with focus on specific sectors. They do not contemplate the city from a holistic perspective or they simply consider a minimum number of Latin American cities in their analyses.



Non-exhaustive illustrative example

The previous translates into only a few cities in Latin America inside global rankings with very low evaluations, providing information of little or no value for the implementation of improvement actions. The IDB identified this gap and, in 2018, began collaborating with the consulting firm Deloitte in the **definition of a methodology and a tool adapted to the context of the region to measure the level of maturity of its cities.**

## 1.2. Previous considerations of the methodology

Prior to the approach, definition and development of the Smart maturity assessment methodology, a series of **considerations that focused the scope of the work were developed:**

**Adaptation to the reality and context of Latin America and the Caribbean.**

The conceptualization of the city contemplated the context in Latin America and the Caribbean, the specific challenges faced by the cities of the region and any other circumstances and conditions that conform these urban systems. This consideration is developed following the **need to make a methodological approach as personalized as possible, allowing the realization of a diagnosis that provides a real strategic value for the cities evaluated.**

Accordingly, the dimensions established to carry out the assessment of the Smart maturity of the municipalities must be adjusted, as far as possible, to the public services actually provided.

**Aligned with the United Nations Sustainable Development Goals.**

The 2030 Agenda for Sustainable Development, adopted by all UN Member States in 2015, provides a shared model for the 17 Sustainable Development Goals (SDGs). It recognizes that measures to end poverty must be defined in conjunction with strategies to improve health and education, reduce inequality and foster economic growth, while addressing climate change and the preservation of oceans and forests.

By adopting the 2030 Agenda, countries take responsibility and establish a national framework to achieve the SDGs through policies, plans and programmes. The Addis Agenda aligns all flows of resources, policies and international agreements with economic, social and environmental priorities.

The IDB supports the countries of the region in their efforts to achieve the SDGs. It has also aligned its strategic framework and established a public-private coordination team to identify synergies and business opportunities, as well as to mobilize greater financing, and leverage its financial resources, technical experiences and multilateral coordination in support of the public and private sectors to achieve them.

The application of technological tools in cities is key in the 2030 Agenda as they provide an opportunity to drive the success of the SDG Sustainable Development Goals by increasing the efficiency of processes, service levels and accessibility to public services. This improves the citizens' quality of life and makes them protagonists of the city transformations. Therefore, cities seek to incorporate technology as a tool in their planning and service delivery mechanisms.

Despite the existence of some standards for smart cities, no systematic planning mechanism is identified. In addition, low levels of investment in research and development, slow uptake of technology, limited coordination among key players, regulatory barriers, low levels of investment, and a widening gap in terms of workforce skills, are all factors that inhibit increasing the maturity level of cities to become more dynamic smart cities and jeopardize their ability to adapt to the current technological disruption.

The IDB seeks to increase its support to find solutions that close these gaps in a variety of ways, help the region adapt to technological change and take advantage of the opportunities it offers. Improvements are needed in the mobilization of domestic resources (such as optimizing collection and strengthening the efficiency of public spending) and continuing to support public and private clients to design and implement PPP projects to fill the financing gap.

In this sense, this project is particularly relevant, given that **the creation of a methodology and tool to evaluate the state of maturity of cities in the region in relation to Smart Cities allows to identify strengths and areas of opportunity. Above all, a 5-year Action Plan with investment projects and enablers to be smarter cities prepared for challenges generated by their economic development and population growth.**

**Oriented towards operability in the evaluation process.**

The methodology is built in the simplest way possible with the aim of **ensuring that any public manager can use it to carry out an autonomous reflection on the degree of Smart maturity of the city.** This enables the empowering for own decision-making processes.

Additionally, the methodology **generates easily interpretable results** and, where appropriate, comparable. This will allow to identify potential improvement areas and guide the development of Smart action plans for cities.

Finally, the extraordinary situation arised since 2020 involving the coronavirus pandemic has reinforced this requirement and has also made it indispensable to **incorporate into the evaluation process the possibility of deployment both face-to-face and remotely.** To respond to this consideration, **a computer tool has been developed in Excel**, which facilitates the application of the methodology in cities.

### 1.3. Objectives of the document

On the basis of the context and the previous considerations made, this document is presented as **Main objective to present a manual for the use of the Smart maturity diagnostic tool** developed within the framework of the work carried out by the Inter-American Development Bank in collaboration with Deloitte. To this end, the following contents are presented in the following pages:

- First, a **detailed description of the defined methodology** that allows to understand the mechanics that articulate it and to interpret properly the results obtained.
- Secondly, the **manual of use of the developed tool** to facilitate its application in cities.



## 2. Description of the methodology

The methodology developed is raised from a **multiple perspective** in order to contemplate every aspect that conforms the management of a city. From the different dimensions that enable the quality of life, economic competitiveness and sustainability of the urban ecosystem, to the technological infrastructures that support the development of city intelligence projects, passing through the different public services that are provided to the agents that live and operate in the municipality, as well as the capabilities and technologies involved in such provision. Likewise, the methodology has been integrated into the assessment of the resilience capacity of cities to extraordinary and adverse circumstances that may alter their normal functioning, such as natural disasters or other crises (economic, health, etc.) depending on the use made of technology in public management.

### 2.1. Conceptual framework

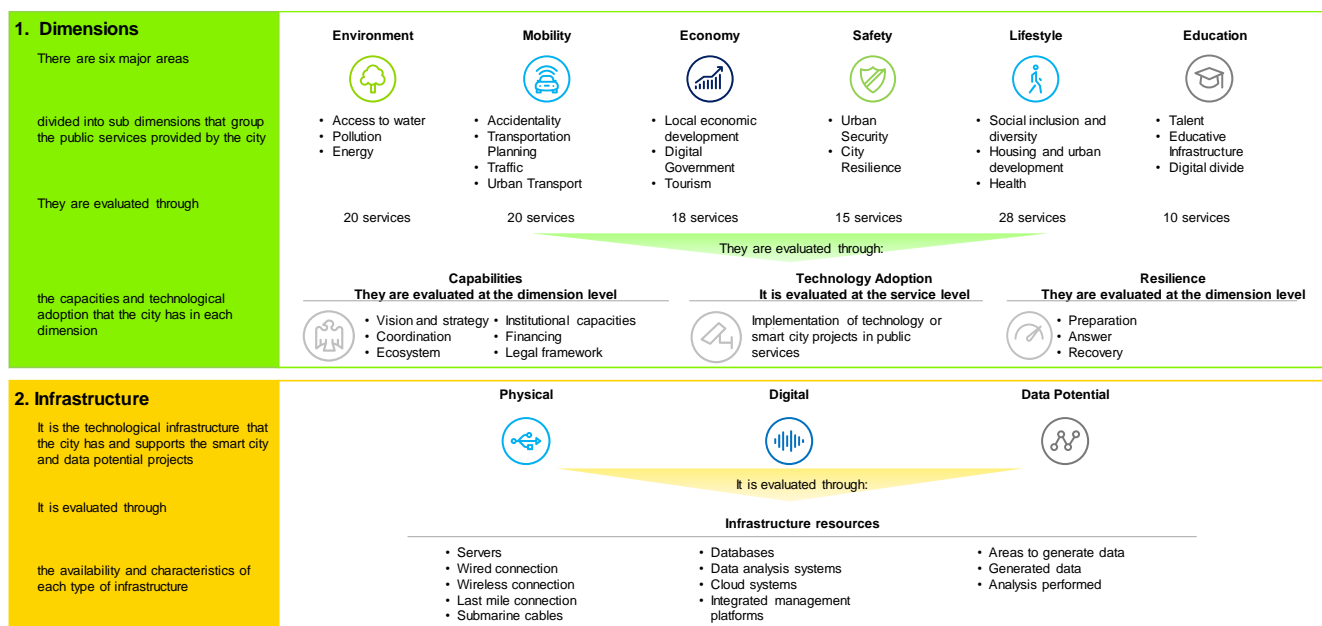
The methodology has been developed taking into account existing methodologies, adapting best practices and lessons learned, based on **two principles**:

**Adapted to the local context:** *The Methodology adapts to the reality and context of the region, considering that the methodologies analyzed were developed for regions of the world with different conditions.*

**Generating benefits for cities:** *The Methodology allows cities to:*

- Know their level of maturity.
- Identify areas of opportunity to become a smarter city.
- Identify investments and priority projects to increase maturity as a Smart City.

The Methodology has two areas of evaluation: Infrastructure and dimensions.



These areas of evaluation are explained below.

### 2.1.1 Dimensions.

Dimensions are the large areas of action of a city and are divided into subdimensions. In order to define them, the main areas of public service delivery in Latin America and the Caribbean were considered and subsequently validated by Deloitte experts with extensive experience in the development of sectoral projects in the region. Each dimension is divided into subdimensions and, subsequently, each subdimension groups together the public services provided by the cities.

*Details of the public services defined for each sub-dimension can be found in Annex 1.*

Dimensions are understood as following:

i. Environment.

A smart city must promote the development and improvement of the quality of life, but always with a sustainable and ecological approach. Therefore, this dimension includes pollution, energy and access to water.

ii. Mobility

The whole dynamic of a city is based on the displacements and transfers of its citizens. In this sense, a smart city must take care of the quality of its transport systems and the safety of transfers. Therefore, urban transport, transport planning, accidents and traffic are taken into account.

iii. Economy

The economic value of a city, as well as generation of wealth, are basic elements that act as engines of development. Therefore, promoting innovation and a creative economy is essential to improve the quality of life of citizens; if it is facilitated through digital government, even more. This dimension includes local economic development, digital government and tourism.

iv. Safety

In order to reach broad development of human lives in cities, urban security is a crucial element in the existence of an environment that guarantees the integrity of citizens and includes initiatives for the constitution of a sustainable social model, based on communication, the generation of synergies and insurance. In addition, it is essential that the city has the capacity to respond and the necessary elements to recover in emergency situations. Therefore, this dimension includes citizen security and resilience.

v. Lifestyle

This dimension includes social inclusion and diversity, housing and urban development, and health. These aspects impact the quality of life of citizens and how they develop their daily lives. Cities can encourage the use of technology to improve these aspects and the lives of citizens.

vi. Education

In an increasingly technology-oriented world, cities present a double challenge opportunity: on the one hand, to prepare their inhabitants to live in an increasingly connected society; on the other hand, to take advantage of these technological advances in order to adapt and personalize the academic training of citizens. Therefore, this dimension includes talent, educational infrastructure and digital divide.

To assess maturity, the capabilities, technological adoption and resilience of the city in each dimension are analyzed:

### Capabilities.

These are the points that a city must have or develop to promote Smart City projects and includes

- Vision and strategy

It refers to what level the Smart City concept includes the vision of the city. This means, whether it has a smart city strategic plan or whether it is expressly mentioned in its planning. It also assesses the extent to which the application of technological solutions is considered a tool for planning public services and solving the city's problems.

- Coordination

It evaluates the degree to which coordination mechanisms and tools among secretariats promote project design and implementation, citizen participation and the communication of results.

- Institutional capacities.

It is the capacities of human resources that work in city government, in terms of knowledge and number of people, to develop smart city projects. In the same way, it includes the tools that the personnel possess, such as computer equipment and software.

- **Ecosystem**  
Evaluate the degree of development that other actors in the city have to promote projects and the collaboration that exists with the city to carry them out. These actors are other spheres of government, private sector, educational institutions, organized civil associations and non-profit organizations.
- **Financing**  
Financing is vital for project development. For this reason, the access to sources to which it can access are evaluated. The main objective is to establish the available resources beyond the budget, such as donations or grants.
- **Legal framework**  
In all kinds of projects, it is important to understand the possibilities offered by laws. In this sense, this capacity evaluates whether the legal structure of the city encourages or hinders the development of city projects requirements or obligations that must be met.

#### Technology adoption.

In this section, the methodology evaluates the degree to which the city implements its technological solutions and tools as a way to improve the delivery of public services in each dimension. At the methodological level, and in such a way that the understanding of the results is facilitated later, a categorization has also been established among the services that allows to draw more qualified conclusions based on two typologies:

- **Smart city services**  
They are those services oriented to the management of the city as a singular entity, with the aim of preserving or improving its structures and/or capacities.
- **Citizen interaction services**  
They are those services oriented to the dialogue and specific service to the people, ultimate recipients of the advantages offered by the city.

As for the evaluation of this area, the Methodology presents a list of specific technologies and identifies those used by the city and what is their degree of adoption in the city. For example, in mobility, the methodology evaluates whether the city uses smart traffic lights or not; if used, how much it uses them. That is, whether they were implemented throughout the city or simply in some area, such as in the center of the city, or simply on major avenues, and how they use them.

*The details of the catalogue of technological solutions identified for each of the dimensions, categorized according to the role they adopt (city management or interaction with the citizen) can be found in Annex 2 of this document.*

#### Resilience.

The methodology considers a concept of resilience, which refers to the city's ability to cope with and respond to natural, health or other crises or emergencies and ensure the continuity of public services. Resilience is assessed at the level of dimension, not the whole city. Its evaluation is carried out through the technological tools that the city uses in the services it provides, and through questions about the capacities that the city has in each dimension in the stages of Preparation, Response and Recovery in emergency situations and natural, health or other crises.

*The details of the catalogue of technological solutions identified for each of the dimensions, categorized according to the resilience phase to which they contribute, can be found in Annex 2 of this document.*

### 2.1.2 Infrastructure

The methodology evaluates throughout the city the available physical and digital infrastructures to support the development and operation of technological tools and solutions. It is proposed as an analysis perspective focused on availability and quality, since it is the basis for the execution and operation of the other projects, functioning as a facilitator of new technologies. In addition, the methodology considers the potential of the data generated by the city, taking into account what data is collected, whether they are collected centrally or by dependency, and which they are used for the strategic planning of the city.

To assess maturity, the physical and digital infrastructure of the city was evaluated.

- **Physical infrastructure** considers the existence of infrastructure that allows, supports and facilitates the use of technological tools, providing them with a structure so that they have connectivity:
  - o Servers and Data Centers.
  - o Wired connection.



- o Wireless connection.
- o Satellite connection.
- o Last mile connection.
- o Underwater cables, if applicable.
- The digital infrastructure allows the processing and analysis of the information collected, Four types were considered:
  - o Databases.
  - o Data analysis systems.
  - o Cloud systems.
  - o Integrated management platforms.
- Data potential:
  - o Areas that generate data.
  - o Data generated.
  - o Analysis performed.

### 2.1.3 Compliance with previous considerations

The proposed methodology complies with the preliminary considerations made in point 1.2 of the present document as follows:

**Adapted to the reality and context of Latin America and the Caribbean.**

At the level of conceptualization, an effort has been made to **establish a standardized methodology as adjusted as possible to the reality of Latin America and the Caribbean**. This setting is developed on two levels:

- Firstly, in the **design of the methodology**: the dimensions and subdimensions through which the evaluation methodology has been conceptualized are the result of a work process and contrast with sectoral experts with years of professional experience in projects developed in Latin America and the Caribbean, which guarantees their knowledge of the reality and problems of this specific context.
- Secondly, in the **implementation process**: in addition, and to further facilitate the adaptation of this to the specific case, the tool in which the methodology described is substantiated **allows cities to select<sup>3</sup> those services which they actually provide and to omit those which they do not**, avoiding the penalty in the score, adapting the evaluation framework and allowing to obtain more personalized results.

**Aligned with the United Nations Sustainable Development Goals.**

The methodology covers areas such as mobility, security, environment, economy and lifestyle, as well as the physical and digital infrastructure of the city to identify areas for improvement that will allow to achieve some of the SDGs regarding health, gender equality, clean water and sanitation, affordable and sustainable energy, decent work and economic growth, industry, innovation and infrastructure, inequity reduction, responsible consumption and production, climate action, life on earth, justice and strong institutions, among others<sup>4</sup>.

Specifically, **through the subdimensions and services considered in the methodology, the dimensions are aligned with the SDGs as follows:**

Environment: Aligns with SDGs 6, 7, 11, 12 and 13<sup>5</sup>. The detail is presented below:

- SDG 6 Clean water and sanitation: All services on the access to water sub-dimension are aligned with this SDG, as the services consider universal access to adequate sanitation and hygiene services, as well as water pollution problems.
- SDG 7 Affordable and clean energy: All pollution and energy subdimension services are aligned with this SDG, as they evaluate the use of technologies in energy consumption, as well as environmental certifications for construction and operation and buildings and energy efficiency and distributed generation in the city. In this sense, the environment dimension is aligned with the goals of this SDG, which include substantially increasing the share of renewable energy in

<sup>3</sup> The detail of the operation of this option is included in chapter 3 of this document, "Tool use manual".

<sup>4</sup> Correspondent to: 11 Sustainable cities and communities, 1 No poverty, 5 Gender equality, 6 Clean water and sanitation, 10 Reduced inequalities y 13 Climate action

<sup>5</sup> SGD 6: <https://www.un.org/sustainabledevelopment/es/water-and-sanitation/>; SGD 7: <https://www.un.org/sustainabledevelopment/es/energy/>; SGD 11: <https://www.un.org/sustainabledevelopment/es/cities/>; SGD 12: <https://www.un.org/sustainabledevelopment/es/sustainable-consumption-production/>; SGD 13: <https://www.un.org/sustainabledevelopment/es/climate-change-2/>

the global energy matrix, doubling the rate of improvement in energy efficiency by 2030, and expanding infrastructure and modernizing technology for the provision of modern and sustainable energy services.

- **SDG 11 Sustainable cities and communities:** The pollution and energy subdimensions are aligned with the SDGs in target 11.6, which proposes to "reduce the negative per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management".
- **SDG 12 Responsible production and consumption:** The pollution sub-dimension is aligned with goal 12.5, which seeks to "significantly reduce waste generation through prevention, reduction, recycling and reuse activities".
- **SDG 13 Climate Action:** The Pollution sub-dimension is aligned with these SDGs through the services that this sub-dimension considers, as they contribute to the specific objectives of these SDGs, which include: integrating climate change measures into national policies, strategies and planning; implement the commitment made by developed country Parties to the United Nations Framework Convention on Climate Change (UNFCCC); promote capacity-building mechanisms for climate change planning and effective management, among others.

**Mobility:** Aligns with SDGs 7, 9 and 11.<sup>6</sup> The detail is presented below:

- **SDG 7 Affordable and clean energy:** The urban transport sub-dimension considers services aligned with target 7.a to "increase international cooperation to facilitate access to clean energy research and technology, including renewable sources, energy efficiency and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean technologies".
- **SDG 9 Industry, Innovation and Infrastructure:** The urban transport sub-dimension considers services aligned with target 9.5 "increase scientific research and improve the technological capacity of industrial sectors in all countries, in particular developing countries".
- **SDG 11 Sustainable Cities and Communities:** Transport and urban transport planning subdimensions consider services that are aligned with targets 11.2 "to provide access to safe, affordable, accessible and sustainable transport systems for all and to improve road safety, in particular by expanding public transport, paying special attention to the needs of people in vulnerable situations, women, children, persons with disabilities and the elderly" and 11.6 "reduce the negative per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management".

**Economy:** Aligns with SDGs 1, 8, 9 and 16.<sup>7</sup> The detail is presented below:

- **SDG 1 End poverty:** The local economic development sub-dimension considers that services aligned with target 1.4 "ensure that all men and women, in particular the poor and the most vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control of land and other property, inheritance, natural resources, new technologies and economic services, including micro-finance."
- **SDG 8 Decent Work and Economic Growth:** The services of the local economic development sub-dimension are aligned with this SDG, as they include technologies that help the city meet the goals considered in the sustainable development goal. In particular, services align with target 8.3 "Promote development-oriented policies that support productive activities, the creation of decent jobs, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro, small and medium-sized enterprises, including through access to financial services". In addition, the Local Economic Development and Tourism subdimensions are aligned with target 8.9 "to develop and implement policies aimed at promoting sustainable tourism that creates jobs and promotes local culture and products".
- **SDG 16 Peace, Justice and Strong Institutions:** The digital government sub-dimension considers services aligned with targets 16.6 "Create effective and transparent institutions at all levels that are accountable" and 16.10 "Ensure public access to information and protect fundamental freedoms, in accordance with national laws and international agreements".

<sup>6</sup> SGD 7: <https://www.un.org/sustainabledevelopment/es/energy/>; SGD 9: <https://www.un.org/sustainabledevelopment/es/infrastructure/>; SGD 11: <https://www.un.org/sustainabledevelopment/es/cities/>

<sup>7</sup> SGD 1: <https://www.un.org/sustainabledevelopment/es/poverty/>; SGD 8: <https://www.un.org/sustainabledevelopment/es/economic-growth/>; SGD 9: <https://www.un.org/sustainabledevelopment/es/infrastructure/>; SGD 16: <https://brasil.un.org/pt-br/sdgs/16>

Security: Aligns with SDGs 11 and 16.<sup>8</sup> The detail is presented below:

- SDG 11 Sustainable Cities and Communities: The Resilience sub-dimension aligns with target 11.5 "significantly reduce the number of deaths caused by and people affected by disasters, including water-related disasters, and significantly reduce direct economic losses caused by disasters".
- SDG 16 Peace, Justice and Strong Institutions: The services of the urban security sub-dimension are aligned with specific targets 16.1 "Significantly reduce all forms of violence and related mortality rates worldwide" and 16.5 "Significantly reduce corruption and bribery in all its forms".

Lifestyle: Aligns with SDGs 1, 3, 5, 9, 10, 11 and 16.<sup>9</sup> The detail is presented below:

- SDG 1 End Poverty: The services considered in the social inclusion and diversity sub-dimension are aligned with target 1.3, which seeks to "Implement at the national level appropriate social protection systems and measures for all and, by 2030, achieve broad coverage of the poor and the most vulnerable".
- SDG 3 Health and Well-being: All services of the health sub-dimension are aligned with the specific targets of this SDG. In particular, there is greater alignment in targets 3.8 "Achieve universal health coverage, including protection from financial risks, access to quality essential health services and access to safe, effective, affordable and quality medicines and vaccines for all" and 3.d "Strengthen the capacity of all countries, in particular developing countries, in the areas of early warning, risk reduction and risk management for national and global health."
- SDG 5 Gender Equality: The services of the social inclusion and diversity sub-dimension are aligned with this SDG. In particular, the goals that most align with this sub-dimension are 5.1 "End all forms of discrimination against all women and girls worldwide", 5.2 "Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual exploitation and other forms of exploitation", 5.5 "Ensure the full and effective participation of women and equal opportunities for leadership at all decision-making levels in political, economic and public life", 5.b "Improve the use of enabling technology, in particular information and communication technology, to promote the empowerment of women" and 5.c "Adopt and strengthen sound policies and enforceable laws to promote gender equality and empowerment of all women and girls at all levels."
- SDG 9 Industry, Innovation and Infrastructure: The housing and urban development sub-dimension considers services that align with target 9.1 "Develop quality, reliable, sustainable and resilient infrastructure".
- SDG 10 Reduction of Inequalities: The services of the social inclusion and diversity sub-dimension are aligned with specific goals 10.2 "to enhance and promote the social, economic and political inclusion of all persons, regardless of age, sex, disability, race, ethnicity, origin, religion or economic situation or other status", 10.3 "Ensure equal opportunities and reduce inequality of outcomes, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and measures in this regard" and 10.7 "Facilitating orderly, safe, regular and responsible migration and mobility of individuals, including through the implementation of planned and well-managed migration policies".
- SDG 11 Sustainable Cities and Communities: The social inclusion and diversity sub-dimension considers services that align with target 11.3 "increase inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable planning and management of human settlements in all countries"
- SDG 16 Peace, Justice and Strong Institutions: Some services of the social inclusion and diversity sub-dimension are aligned with target 16.2 "End abuse, exploitation, trafficking and all forms of violence and torture against children".

Education: Aligns with SDGs 4 and 8.<sup>10</sup> The detail is presented below:

- SDG 4 Quality Education: The services of the talent, educational infrastructure and digital divide subdimensions, as well as the skills considered in the methodology are aligned with specific targets 4.1 "to ensure that all girls and boys complete primary and secondary education, which must be free, equitable and of quality and produce relevant and effective learning outcomes", 4.4 "significantly increase the number of young people and adults who have the necessary skills, including technical and professional skills, to access employment, decent work and entrepreneurship", 4a "Build and adapt educational facilities that take into account the needs of children and persons with disabilities and gender

<sup>8</sup> SGD 11: <https://www.un.org/sustainabledevelopment/es/cities/>; SGD 16: <https://brasil.un.org/pt-br/sdgs/16>

<sup>9</sup> SGD 1: <https://www.un.org/sustainabledevelopment/es/poverty/>; SGD 3: <https://www.un.org/sustainabledevelopment/es/health/>; SGD 5: <https://www.un.org/sustainabledevelopment/es/gender-equality/>; SGD 9: <https://www.un.org/sustainabledevelopment/es/infrastructure/>; SGD 10: <https://www.un.org/sustainabledevelopment/es/inequality/>; SGD 11: <https://www.un.org/sustainabledevelopment/es/cities/>; SGD 16: <https://www.un.org/sustainabledevelopment/es/peace-justice/>

<sup>10</sup> SGD 4: <https://www.un.org/sustainabledevelopment/es/education/>; SGD 8: <https://www.un.org/sustainabledevelopment/es/economic-growth/>

differences, and that provide safe learning environments, non-violent, inclusive and effective for all" and 4.c "significantly increase the supply of qualified teachers, including through international cooperation for teacher training".

- **SDG 8 Decent Work and Economic Growth:** The digital divide sub-dimension includes services that align with target 8.6, which seeks to "significantly reduce the proportion of young people who are not employed and do not attend education or training."

























In addition, the methodology takes into account the physical and digital infrastructure, as well as the data potential of the city, which are aligned with SDG 9 Industry, Innovation and Infrastructure, in target 9.c "Significantly increase access to information and communication technologies and strive to provide universal and affordable access to the Internet in the least developed countries".

On the other hand, the methodology evaluates the resilience of the city in a transversal way, through the level of use of the services provided to citizens in emergency situations. In this regard, the methodology is aligned with SDG 13 in the target 13.1, looking for "enhance resilience and adaptability to climate-related risks and natural disasters in all countries."

Finally, the methodology considers in a transversal way the different capacities that are aligned with SDG 17 "Partnerships to achieve the goals". The capacities that align with the SDGs are:

- **Coordination** with other ecosystem agents
- Development of technological projects and initiatives with agents of the **ecosystem**
- **Financing** through different sources
- **Institutional capacities**, both the staff of the city secretariats and the tools available for the development and implementation of technological and smart city initiatives

The following table shows a summary of the alignment of the SDGs with this methodology:

	Environment 	Mobility 	Economy 	Safety 	Lifestyle 	Education 	Infrastructure 
1 <b>FIN DE LA POBREZA</b> 			•Local economic development		•Social inclusion and diversity		
2 <b>HAMBRE CERO</b> 							
3 <b>SALUD Y BIENESTAR</b> 					•Health		
4 <b>EDUCACIÓN DE CALIDAD</b> 						•Talent •Educative Infrastructure •Digital divide	
5 <b>IGUALDAD DE GÉNERO</b> 					•Social inclusion and diversity		
6 <b>AGUA LIMPIA Y SANEAMIENTO</b> 	•Access to water						
7 <b>ENERGÍA ASEQUIBLE Y NO CONTAMINANTE</b> 	•Pollution •Energy	•Urban transport					
8 <b>TRABAJO DECENTE Y CRECIMIENTO ECONÓMICO</b> 			•Local economic development			•Digital divide	
9 <b>INDUSTRIA, INNOVACIÓN E INFRAESTRUCTURA</b> 		•Urban transport	•Digital Government •Tourism		•Housing and urban development		•Physical and Digital Infrastructure •Data Potencial
10 <b>REDUCCIÓN DE LAS DESIGUALDADES</b> 					•Social inclusion and diversity		
11 <b>CIUDADES Y COMUNIDADES SOSTENIBLES</b> 	•Pollution •Energy	•Transportation planning •Urban transport		•City resilience	•Social inclusion and diversity		
12 <b>PRODUCCIÓN Y CONSUMO RESPONSABLES</b> 	•Pollution						
13 <b>ACCIÓN POR EL CLIMA</b> 	•Access to water •Pollution •Energy			•City resilience			
14 <b>VIDA SUBMARINA</b> 	In a transversal way, the Methodology considers the resilience of the city for each dimension						
15 <b>VIDA DE ECOSISTEMAS TERRESTRES</b> 							
16 <b>PAZ, JUSTICIA Y INSTITUCIONES SÓLIDAS</b> 			•Digital Government	•Urban security	•Social inclusion and diversity		
17 <b>ALIANZAS PARA LOGRAR LOS OBJETIVOS</b> 	In a transversal way, the Methodology considers, for each dimension, the coordination capacity of the city with the other agents at an internal and external level (state, national, with other countries and with multilateral agents)						

Oriented towards operability in the evaluation process.

This methodology will be implemented through a digital tool that allows any public manager to carry out a self-diagnosis work, both face-to-face and remote, and use the results as an element of reflection in the future.

## 2.2. Evaluation structure

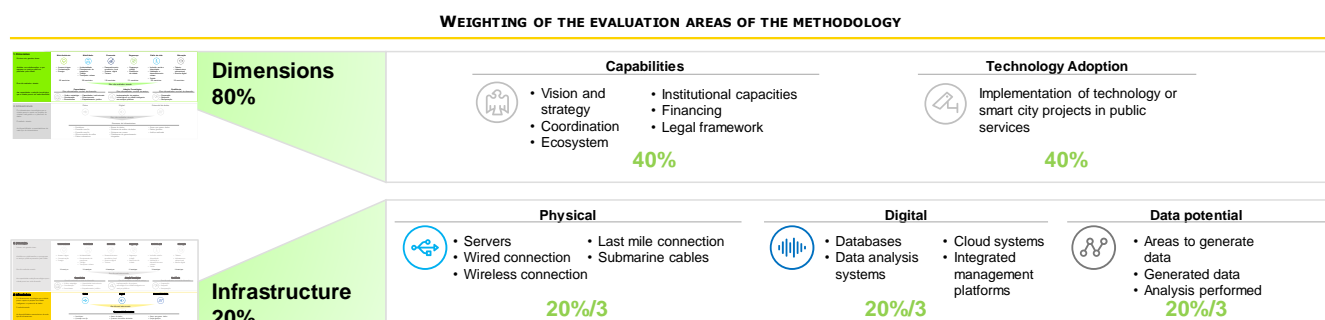
The evaluation is carried out through a tool in Excel that contains a form to be filled out by the person responsible for the process, which can be from the Deloitte team or the city to be evaluated. Along with this form, the tool has a dashboard that allows you to obtain a first view of the results obtained graphically and visually to facilitate the understanding of the score obtained.

## 2.2.1 Weighting of evaluation areas

The allocation of weight to the evaluation areas was identified as a recommended practice in the analysis of international cases mentioned above, because it allows to define different priorities for each evaluation area. To assign the weights of each area of the Methodology, the following were considered:

- **Dimensions**  
A city's resources, as defined above, are the cornerstone that allows it to plan and develop a smart city, since they include the vision that the city has to make this approach, its ability to finance projects, the process of collaboration between the actors of the smart city ecosystem, the opening of its legal structure, among others.  
On the other hand, it is in the technological adoption that it is possible to identify the advances in the execution of technological projects to be a smart city, since it demonstrates how the city begins to employ solutions to improve planning and the provision of services.
- **Infrastructure.**  
Although infrastructure is indispensable for the operation of all technological solutions, the Methodology recognizes that all cities, with the exception of remote or isolated communities, have at least some form of infrastructure. In turn, it is essential to assess the current situation of the city in terms of data capture and the potential that this represents to improve planning and service delivery

In this sense, the Methodology establishes the following weights for each evaluation area:



Once the weights were defined, the questions that the Methodology would include were defined.



## 2.2.2 Questions about the methodology

### Dimensions

- Vision and strategy**
  - 1 multiple choice question
  - 2 open question
- Coordination**
  - 5 Yes/No questions
  - 2 Very good / good / medium / low / very low questions
- Ecosystem**
  - 4 questions for each actor
- Institutional capacities**
  - 7 Very high / high / medium / low / very low questions
- Financing**
  - 4 Yes/No questions
  - 4 questions for each financing source
- Legal Framework**
  - 3 Yes/No questions
  - 2 open questions
  - 1 Very high / high / medium / low / very low questions

### Capabilities

**Vision and strategy**

- 1 multiple choice question
- 2 open question

**Coordination**

- 5 Yes/No questions
- 2 Very good / good / medium / low / very low questions

**Ecosystem**

- 4 questions for each actor

**Institutional capacities**

- 7 Very high / high / medium / low / very low questions

**Financing**

- 4 Yes/No questions
- 4 questions for each financing source

**Legal Framework**

- 3 Yes/No questions
- 2 open questions
- 1 Very high / high / medium / low / very low questions

### Technology Adoption

**For each service of the dimensions and sub-dimensions**  
1 question about the use of technology.

For example:

Public lighting  
Level of technology use in the city

- LED Technology 1-5
- Automation 1-5
- Control Nodes 1-5
- Motion sensors 1-5

Resilience will be identified through the use of technologies in the city that can be used to prepare, respond and recover from emergency situations.

### Infrastructure

**Infrastructure**

**Cobertura**

**Penetración**

**Accesibilidad**

**Servers**

Data center propio

Servidor remoto

**Wired connection**

Cobre

Fibra óptica

**Wireless connection**

3G

4G

**last mile connection**

Puntos Wi-Fi

**International connection**

Cables submarinos

**¿Cómo se maneja la generación, recolección y análisis de datos?**

Por dependencia

Amboas

**¿Qué datos se generan y recolectan?**

**¿Qué análisis se hacen con esos datos?**

**Bases de datos**

**Sistemas de datos**

**Sistemas en nube**

**Plataformas de gestión integradas**

Se utiliza este tipo de infraestructura para dar respuesta a los retos de la demanda

La infraestructura dispone de un volumen de datos adecuado para maximizar su aprovechamiento

Se han establecido políticas para la utilización de los datos contenidos en estas infraestructuras

La infraestructura tiene autonomía para la captura e integración de datos

Los datos generados se encuentran disponibles de forma accesible (formato y compatibilidad)

Se cuenta con un sistema de gestión de base de datos relacional (RDBMS) que asegure la redundancia de los datos

La infraestructura digital en cuestión se ha puesto en marcha para la gestión de servicios relacionados con las dimensiones

Se cuenta con sistemas de seguridad específicos para proteger la información contenida en la infraestructura

Each assessment area includes specific questions that allow you to score (between 0 and 5) to establish the maturity level of the city.

In addition, each question has a free text space to add additional information, which can be used to better understand each situation and adjust the answers obtained in multiple-choice questions.

The details of the questionnaire can be found in Annex 3 to this document.

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## 2.3. Generating results

This section describes: i) the results generated by the methodology, ii) the interpretation of maturity levels and iii) the process of calculating the score obtained in terms of Smart maturity and the interpretation of these:

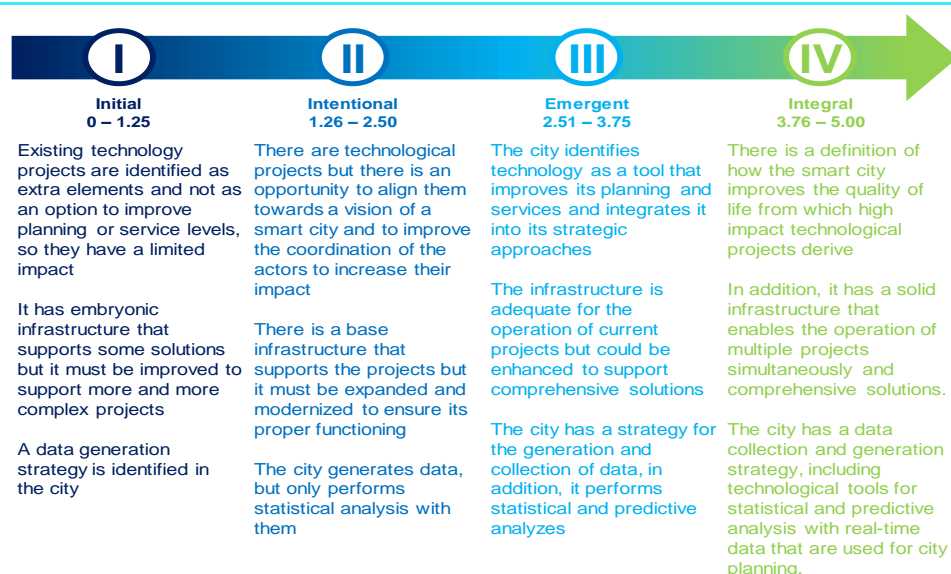
### 2.3.1 Results obtained

The application of the methodology allows to obtain three types of results:



- The **maturity level**<sup>11</sup> is obtained automatically from the questions of the Methodology and the weights of the evaluation areas depending on the score obtained. This score facilitates obtaining a first impression of the level of maturity of the city as a Smart city and identifying potential niches for improvement, although this analysis should be completed with the examination of the qualitative responses obtained during the evaluation process, which will allow to deepen the understanding of the challenges, problems and strengths of the city.

MATURITY LEVELS AS A SMART CITY BY SCORE



The tool also allows you to observe the results from 3 perspectives: global maturity, maturity by dimension and maturity comparison.

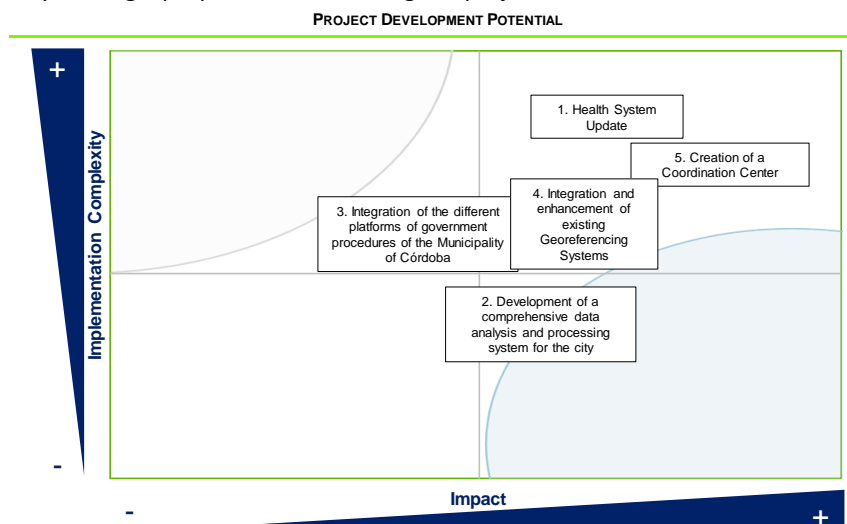
<sup>11</sup> Details of the maturity levels for each assessment area can be found in section 2.3.2. Interpretation of the degrees of maturity.

- The **portfolio of projects** is developed from the information obtained in the interviews with the cities or from the answers to the open questions. Two types of projects can be generated:
  - *Investment projects*: projects that can be carried out to improve the quality of the Infrastructure or the Dimensions, in Technological Adoption and that involve the city to make investments and implement financing schemes, such as Public-Private Partnerships (PPPs) for the realization of projects.
  - *Enabling projects*: projects that can be carried out in the Dimensions, in Capacities and that help to strengthen the points evaluated and that support the development of smart city projects.

For each of the projects identified, a detailed project sheet is developed which details, among other aspects, the problem to which it intends to respond, its objectives, benefits, responsible entity and other entities involved in its development, a high-level description of the initiative and an estimate of the investment (if applicable).

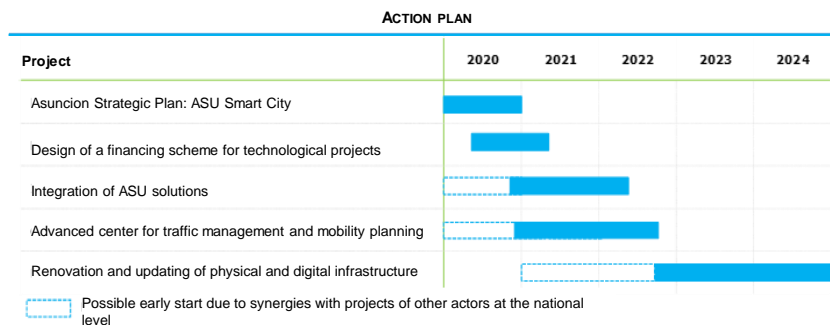
Project Sheet			
dimension	Investment project 5. Establishment of a Coordination Centre		
Problem	<p>The Civil Defense area of Córdoba has a team responsible for answering telephone calls to respond to emergency situations in the city. However, during the interviews it was identified that, occasions, Civil Defense does not have among its competence to attend to some emergency situations. In these cases, they attend to other areas, such as firefighters, provincial police, etc.</p> <p>While there are security cameras in the city, during the interview it was identified that they are used more for traffic monitoring security issues, not so much so for Civil Protection issues.</p>		
Objectives	<p>Improve coordination between actors.</p>		
description	<p>The project consists of creating a Coordination Center that citizens of the city of Córdoba.</p> <p>The Coordination Center could include:</p> <ul style="list-style-type: none"> <li>○ A Monitoring Command Center the services provided and Sustainability, among others;</li> <li>○ Telephone call systems to address emergency situation</li> <li>○ Systems GIS to locate emergency situations;</li> <li>○ Data analytics systems to perform statistical and predictive analysis</li> </ul> <p>For the implementation of the Coordination Center, the city would require:</p> <ul style="list-style-type: none"> <li>○ Physical infrastructure for the monitoring and develop Civil Protection area has;</li> <li>○ Development of digital infrastructure, which could include situations in real time, databases to store the information</li> </ul>		
Problem	Although some areas of the Municipality have georeferenced data systems, during the interviews it was identified that they are not linked to each other.	proceeds	<p>Investment project 4. Integration and Enhancement of existing Georeferenced Information Systems</p> <ul style="list-style-type: none"> <li>• Generate more georeferenced data.</li> <li>• The system would provide useful information to improve city planning and monitor the services provided to citizens.</li> <li>• The system could boost and improve the city's infrastructure</li> <li>• Share information in real time through a comprehensive and transversal Georeferencing System in the Municipality.</li> </ul>
Objectives	<ul style="list-style-type: none"> <li>• Integrate the georeferencing systems that already exist.</li> <li>• Enhance georeferencing tools and platforms, including more georeferenced information.</li> </ul>	Responsible entity	<ul style="list-style-type: none"> <li>• Municipality of Córdoba</li> </ul>
description	<p>The project consists of integrating: (i) The georeferenced data systems of the Emergency Operations Centre; and (ii) the Social Infrastructure Georeferencing System; in a single system. In addition, it would enhance its reach by including data that is not currently georeferenced.</p> <p>The Georeferencing System could include:</p> <ul style="list-style-type: none"> <li>○ Tools to upload and download data, allowing different areas to access homogeneous, complete and real-time information;</li> <li>○ Access to information for citizens;</li> <li>○ Linkage with the Coordination Centre and comprehensive analysis and processing system data to improve emergency response and recovery capacity.</li> </ul> <p>For the implementation of the Comprehensive Georeferencing System, the city would require:</p> <ul style="list-style-type: none"> <li>○ Development of physical infrastructure for the implementation of technological tools with the necessary technical specifications for the management of data that includes the system;</li> <li>○ Development of digital infrastructure, which could include: platforms to monitor in real time the data captured in the system, geolocation during emergency situations in real time, databases to store and share system information, statistical and predictive analysis tools, among others.</li> </ul>		
		Entities involved	<ul style="list-style-type: none"> <li>• Secretariat of Planning, Modernization and International Relations</li> </ul>

- The **action plan**, developed from the project portfolio. In this exercise, the development potential of the projects is considered according to the complexity of their implementation and the expected impact through a prioritization matrix, consequently making a proposal for scheduling the projects identified in a horizon of 5 years.



The development potential is realized by the evaluator considering the results of the methodology and the specific context of the city.

Based on this, the evaluator proposes an Action Plan for the following 5 years:

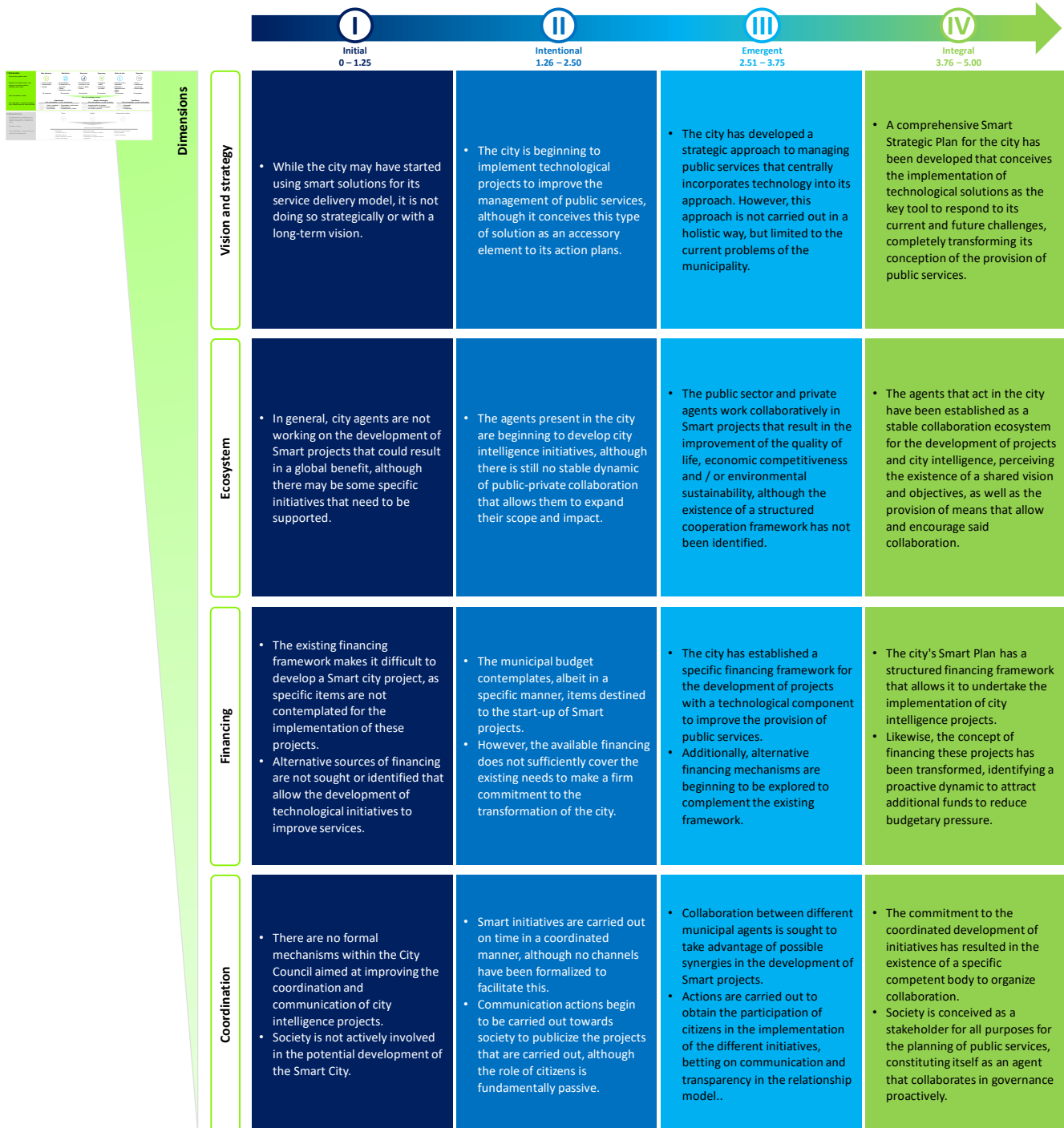


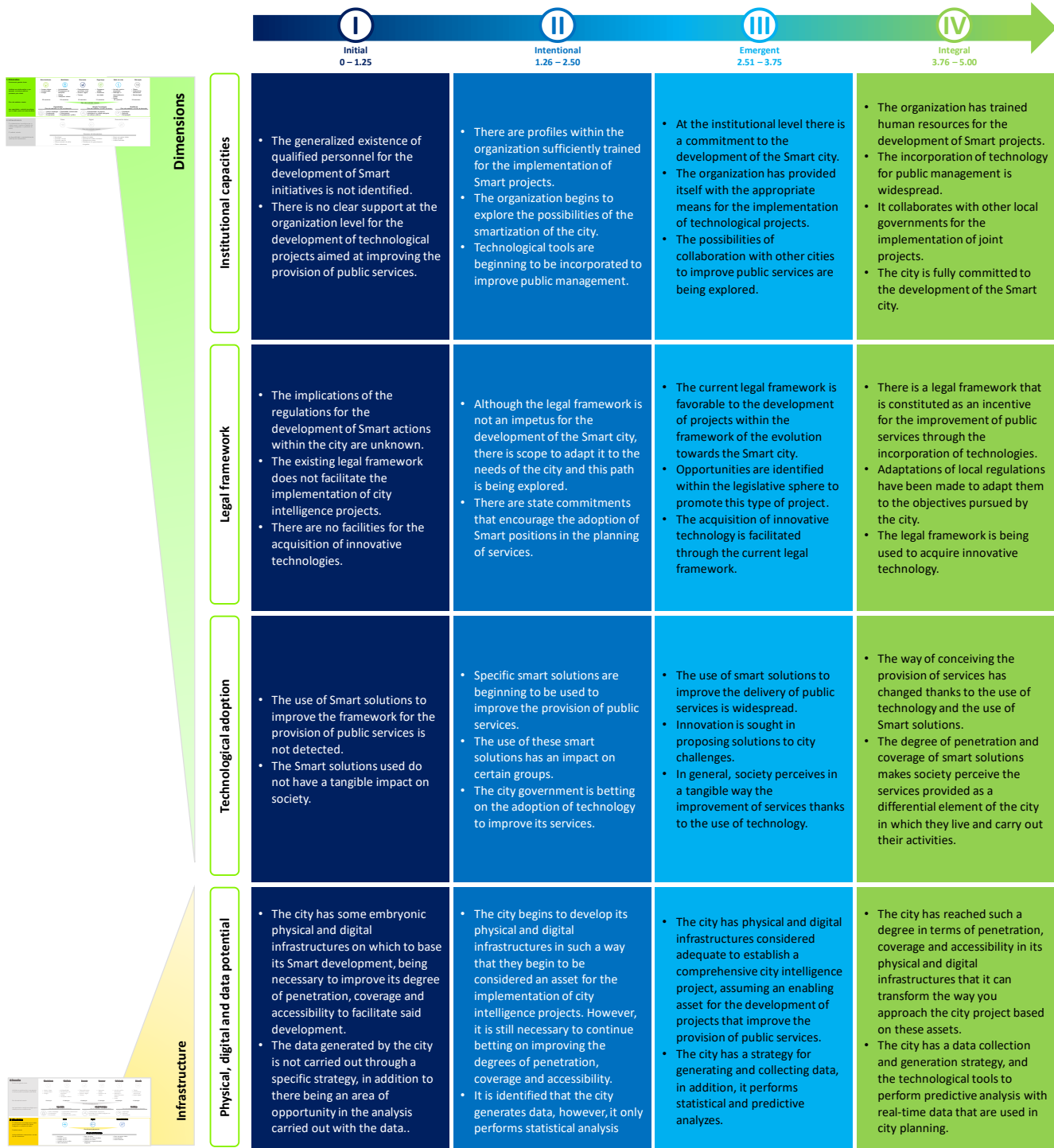
### 2.3.2 Interpretation of degrees of maturity.

Although the score obtained is numerical, this has been quantified based on the questionnaire defined to facilitate the initial understanding of the results obtained by the cities. This categorization is established around 4 phases of development:

- **Initial:** Cities that score between 0 and 1.25 points can be considered at an early stage of their Smart development. In this sense, it is understood that, despite having begun to use technology to improve the quality of the services provided, it is not being carried out from a strategic perspective that contemplates its use in a holistic way and aimed at improving the quality of life, boosting economic competitiveness and ensuring the sustainability of the urban ecosystem.
- **Intentional:** Cities that score between 1.26 and 2.50 points are considered "intentional cities." This means that they have begun to take their first steps in their evolution towards a Smart city model through the orientation of their available technological capabilities and assets towards an efficient management model of the municipal network, but there is still a long way to go.
- **Emergent:** Cities that score between 2.51 and 3.75 points are considered "emerging cities." This implies that there is an intensive use of its capabilities and technologies to improve the different dimensions that make up life in the city. However, at this point there may be differences between some dimensions and subdimensions and others due to different issues (involvement in the Smart project, available resources, strategic vision, etc.). Smart cities are characterised by their holistic approaches and, in this sense, it will be necessary for them to review their less developed areas and make progress in them.
- **Integral:** Cities that score between 3.76 and 5 are considered fully-entitled "Smart cities" as they have established and developed their city intelligence strategy in a comprehensive manner.

Based on these general conclusions, other particularized ones have been developed for the different areas analyzed, in such a way that the interpretation of the results obtained in each of them is facilitated:







### 2.3.3 Calculation methodology.

The calculation methodology used to obtain the scores is based on the Infrastructure and Dimensions as follows:

- Infrastructure: 20%.
- Dimensions: 80%.

The detail is presented below:

#### Infrastructure.

Weighting on overall score: 20%

##### i. Physical infrastructure (Weighting on infrastructure: 1/3)

The Physical Infrastructures score is calculated based on the following formula:

$$Physical\ Infrastructure = \frac{\sum Av.\ Phys.\ Inf}{Phys.\ Inf_{Applicable}}$$

, where *Av. Phys. Inf* it is calculated as the arithmetic mean of the scores obtained in coverage, penetration and accessibility for each of the proposed physical infrastructures (servers, wired connection, wireless connection, last mile connection and international connection) based on the following values:

- Coverage and penetration:
  - 0%-20% = 1
  - 21%-40% = 2
  - 41%-60% = 3
  - 61%-80% = 4
  - 81%-100% = 5
- Accessibility:
  - Easy access = 5
  - Normal access = 3.33
  - Difficulty accessing = 1.66

And where *Phys. Inf<sub>Applicable</sub>* refers to the absolute number of physical infrastructures that apply to the city (ruling out the international connection through submarine cables in the case of cities that have no competence of any kind over coastal areas).

##### ii. Digital infrastructures (Weighting on infrastructures: 1/3)

The Digital Infrastructures score is calculated based on the following formula:

$$Digital\ Infrastructures = \overline{P.\ Digital.\ Infrastructures}$$

, where *P. Digital. Infrastructures* it is calculated as the arithmetic mean of the scores obtained in the different statements presented for each of the proposed digital infrastructures (databases, data analytics systems, cloud systems and integrated management platforms) based on the following values:

- Yes = 5
- No = 0

##### iii. Data potential (Infrastructure weighting: 1/3)

The score on the data potential is obtained from the answer to a single question based on the following values:

- Centrally = 3.33
- Per dependency = 1.67
- Both = 5

## Dimensions.

Weighting on overall score: 80%

### i. Capacities (Weighting on dimensions: 1/2)

The capacities of each of the dimensions (environment, mobility, lifestyle, economy, security and education) are calculated based on the following formula:

$$Capacities_D = \frac{(P.Vision + P.Ecosystem + P.Financing + P.Coordination + P.Institutional + P.LegalFramework)}{6}$$

where *P.Vision* is obtained from the answer to a single question based on the following values:

- There is no strategic planning = 1
- There is a strategic plan for the dimension, but the use of technology is not contemplated = 2
- Specific projects are developed in the dimension with application of technology = 3
- Technology is commonly used in the development of projects in dimension = 4
- The dimension is part of a Smart Plan at the city level = 5

where *P.Ecosystem* it is calculated as the arithmetic mean of the scores obtained with respect to the different agents identified (other municipal areas, large companies, SMEs, startups, educational institutions, innovation centers, accelerators and innovative initiatives, civil associations and non-profit entities) and the work they do on their own or with the city government in Smart matters for the improvement of the dimension based on the following values:

- Autonomous project development and project development in collaboration with the city government:
  - Yes = 5
  - No = 0
- In case they collaborate with the city government, depending on the type of collaboration:
  - Idea generation = 1
  - Project conceptualization = 2
  - Design collaboration = 3
  - Prototyping = 4
  - Project implementation and development = 5

where *P.Financing* is calculated according to the following formula:

$$P.Financing = \frac{(Partidas + Incentivos + Aportaciones + Cobertura + Fuentes)}{5}$$

- for Games, incentives, Contributions and coverage, the score is calculated based on your response:
  - Yes = 5
  - No = 0
- In the case of Sources, the score is calculated as the arithmetic mean of the responses obtained for each of the identified sources of financing (development banking, grants, commercial banking, debt, sponsorships, multilateral financing, public-private partnerships or others), the responses being evaluated according to the following patterns:
  - For questions regarding identification of funding and access to source:
    - Yes = 5
    - No = 0
  - For the percentage of contribution from the source:
    - < 20% = 1
    - 20-40% = 2
    - 40-60% = 3
    - 60-80% = 4
    - > 40% = 5

where  $P.Coordinación$  it is calculated as the arithmetic mean of the scores obtained through the answers given according to two rating scales:

- For affirmative/negative answer questions:
  - Yes = 5
  - No = 0
- For assessment-type answer questions:
  - Very low = 1
  - Low = 2
  - Mean = 3
  - Good = 4
  - Very good = 5

where  $P.CapInstitucionales$  it is calculated as the arithmetic mean of the scores obtained from the assessment-type answers given to the questions based on the following criteria:

- Null / Null / Strongly disagree = 1
- Low / Low / Disagree = 2
- Averages / Medium / Neutral = 3
- High / High / Agree = 4
- Very high / Very high / Totally agree = 5

And where  $P.MarcoLegal$  it is calculated as the arithmetic mean of the scores obtained through the answers given according to two rating scales:

- For affirmative/negative answer questions:
  - Yes = 5
  - No = 0
- For descriptive answer questions:
  - It is an obstacle and its modification is practically impossible (for example, because it is a state or national competence) / The legal framework does not allow the acquisition of innovative technology = 1
  - It is an obstacle, but could be modified to adapt it to the reality of the projects / The legal framework is not prone to the acquisition of innovative technology = 2
  - Does not affect / Does not affect = 3
  - It is appropriate to the needs of the projects / The legal framework facilitates the acquisition of innovative technology = 4
  - It stimulates the development of this type of project (e.g. through the implementation of national programmes) / The legal framework is a real stimulus for the acquisition of innovative technology = 5

*The overall computation is the result of the weighted average of the indicator  $Capacidades_D$  calculated for each of the dimensions of the evaluation model.*

## ii. Technological adoption (Weighting on dimensions: 1/2)

The technological adoption of each of the dimensions (environment, mobility, lifestyle, economy, security and education) is calculated based on the following formula:

$$Adopción_D = \overline{Adopción_{Sub}}$$

where  $Adopción_{Sub}$  corresponds to each of the subdimensions that make up the dimension and is obtained according to the following formula:

$$Adopción_{Sub} = \overline{Adopción_{Ser}}$$

where  $Adopción_{Ser}$  corresponds to each of the services provided in the sub-dimension and is obtained according to the following formula:

$$Adopción_{Ser} = \overline{Adopción_{Tec}}$$

where  $Adopción_{Tec}$  corresponds to the degree/intensity of use of the technologies proposed for the specific service, valued, from lowest to highest, on a scale from 1 to 5.

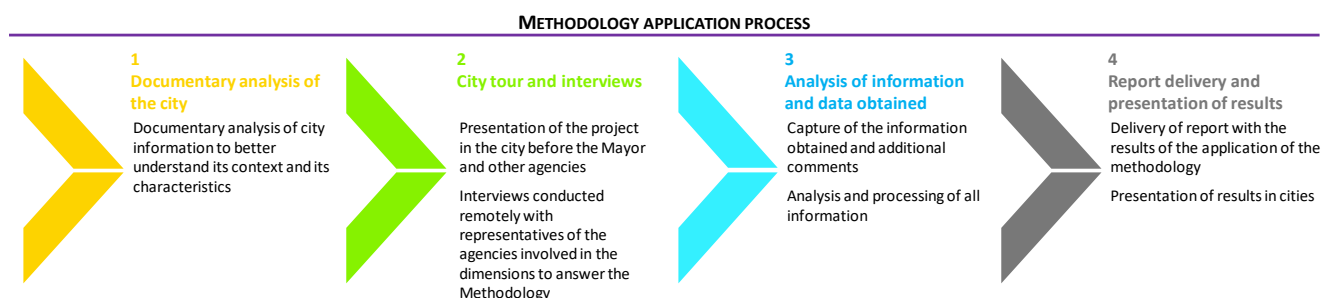
*Additional comments regarding the calculation of technological adoption:*

- *Each city has an idiosyncrasy due to its specific needs, available means and attributed competences. In this sense, although one of the objectives of the methodology is to obtain standardized metrics that allow, among other things, to compare the advances between them and facilitate the identification of success stories in which to be inspired, it is necessary to contemplate a margin of methodological adaptation to obtain an evaluation as adapted as possible and that allows the extraction of conclusions of value for public managers. Therefore, in view of the configuration of the tool, the options have been enabled that will allow the evaluators to define which services are effectively provided by the cities and which are not, thus avoiding that those that are not provided (either because they are not necessary or because they are not of municipal competence) penalize the score obtained.*
- *Likewise, having categorized the technological solutions according to two criteria (type of service and contribution to the resilience of the city), the exploitation of the results through the tool allows to obtain two additional visions that, although they do not affect the overall maturity rating obtained, facilitate deepening the results obtained :*
  - *On the one hand, the degree of technological adoption can be observed in a disaggregated way depending on whether the services are management (services to the smart city) or interaction (services of interaction with the citizen). This indicator allows to see in which of both aspects the use of technology is more intensive and if the difference is critical or minimal, making it easier for the city to identify areas for improvement and possible areas of action.*
  - *On the other hand, the degree of technological adoption can also be observed depending on its intensity of use in the different stages of the city's resilience (preparation, response and recovery). Thus, this indicator allows us to see how much the potential of technology is being exploited to improve the resilience of the Smart City and, subsequently, to reflect in a qualitative way on whether this intensity corresponds effectively to the use that could be given to technology to improve its ability to prevent, face and / or recover from possible extraordinary circumstances.*

## 2.4. Application process

### 2.4.1 Process phases

The process of applying the methodology consists of 4 steps:



These steps are developed as follows:

#### 1. Documentary analysis of the city.

In this activity, an office analysis is carried out with statistical information and data of the city that allow a better understanding of its context and the situation in each of the Dimensions of the methodology, as well as its physical and digital infrastructure.

Basically, three large blocks of information are distinguished that impact on how the city should develop as a Smart city:

- Physical and sociodemographic characteristics.  
Indicators relating to extent, population or climatology are collected, which allows to identify in a preliminary way some of the challenges that the city must face.  
*For example, a city with a larger size should better provide for the organisation of its public transport infrastructures, just as a city with an ageing population should prioritise certain forecasts in terms of health services.*
- Use of information technologies.  
Indicators such as the percentage of the population with Internet access or availability of mobile phones are extracted in order to understand the knowledge and use of technologies by citizens. Through this information, the projects and actions that are defined later to improve the degree of Smart maturity of the city can be more adequately defined, adapting the proposed solutions to the characteristics of the people who inhabit it.
- Governance structures.  
Finally, a review of the municipal structure is carried out, which allows a first identification of the competences and prerogatives of the city and, therefore, of the possibilities of implementing some initiatives or others to improve its position as a Smart City, as well as identifying the incidence of other levels of government in its planning and the need to establish certain alliances to advance towards a stage of Smart maturity elder. This point is especially relevant in services that traditionally involve other levels of government, such as Energy, Water or Citizen Security.

#### 2. Interviews.

For the application of the Methodology, the following activities are carried out:

- Presentation of the project.  
An initial presentation of the project is given to the Mayor, the secretaries and other representatives of the city where the context of the project, the objective pursued, the way in which the interview will be conducted and the results sought are addressed.  
After the initial submission, questionnaires are sent to different areas and Secretariats to answer questions prior to interviews.
- Interviews with representatives of the city.  
In this activity, approximately 2-hour interviews are conducted with government officials representing each of the dimensions and subdimensions and physical, digital and data potential infrastructure. On some occasions,

representatives of the municipal government or other organizations involved, such as concessionaires, may be present.

Before each interview, the city sends out the answered questionnaires, so that the sessions can focus on getting more direct information from the interviewed team.

### 3. Analysis of the information and data obtained.

After the interview, an orderly and systematized capture of the additional information and the comments obtained and analyzed is made to obtain the results related to the maturity levels of the city for Dimensions and Infrastructure. This information obtained through the open questions is also of great interest and importance, not only to better understand the diagnosis of Smart maturity of the city and understand its strengths and weaknesses, but also for the subsequent configuration of the project portfolio and the roadmap for the coming years.

### 4. Reporting and presentation of results

Finally, the report is delivered and a presentation of the results obtained and their meaning and implications is made to the representatives of the city.

#### 2.4.2 Recommendations

Based on the experience of working in the evaluation of cities, a series of recommendations are made to facilitate the application of the methodology and obtain a return of real value for cities:

- **Centralize the process:** Although the defined methodology tries to simplify the evaluation process to ensure the extent of its use when evaluating the Smart maturity of the municipalities, the reality is that the city is constituted as a complex ecosystem, with a wide variety of agents intervening in its operation and development, each with a unique level of competences and attributions. In this sense, it is recommended that the entire process of collection and treatment of the results be carried out by a single work unit with strategic vision, technological knowledge and experience in evaluation processes. In this way, a homogeneous treatment will be allowed or *sanity check* of the answers obtained based on the evidence presented by the different responsible for the services (thus avoiding that the areas misvalue, by excess or by default, their capacity and degrees of technological adoption), as well as will facilitate the dumping of the information about the tool without some answers overlapping with others.
- **Identify interlocutors:** The work team set up to carry out the evaluation of the city must, during the preparation phase of the works, carry out an exhaustive work of identification of the most appropriate interlocutors in the different municipal units in order to obtain the most accurate information in each case. In this regard, it is recommended that questions relating to capabilities be dealt with with management profiles that have a more strategic vision, while, in those aimed at determining the technological adoption of services, they should be dealt with directly with those responsible for the specific services, including technical profiles that help to correctly parameterize the intensity of use of the proposed technologies, if applicable.
- **Develop a communication plan throughout the project:** In a project of this type, in which so many different profiles are involved, it is essential to properly structure the communication flows with all the people who will participate, at one time or another, in the evaluation process. Thus, it is recommended to structure a communicative process in three key moments:
  - **Previously** to the launch of the project, in which the objectives pursued with the initiative are informed, involving the profiles identified from the outset, and the type of collaboration required is established.
  - **During the evaluation process**, not only in the conduct of the interviews, but also in advance (anticipating the questionnaire to allow the interlocutors to make a previous reflection and collect the appropriate information that allows them to support their answers) and later (resolving possible doubts that may arise, communicating the progress produced and reaching out to the incorporation of additional information that could be identified after the interview).
  - **At the end of the jobs**, reporting on the results obtained, explaining their implications and encouraging the different stakeholders to participate in the future strategy or action plan for the future smart city.
- **Provide information for reflection:** In line with what is stated in the previous point, it is recommended to prepare specific dossiers for each interlocutor with the questions that they are expected to answer and to send it well in advance of the face-to-face interview or *online*, in such a way that he can prepare his answers, carry out the



consultations, both internal and external, that he deems appropriate and formulate any doubt that may arise for his resolution prior to the interview.

- **Address the action plan in a comprehensive manner:** Finally, although this recommendation refers to a moment after the application of the methodology, it is considered appropriate to point out that the transformation of a city into a Smart city is a complex task due to the multiple variants it supports. In this line, the evaluation tool allows to obtain a holistic vision of the city, and that same vision should be transferred to the development of the subsequent action plan, understanding the dependencies and complementarities between issues of different kinds such as the use of technologies, the development of human and material capacities, the presence of potential collaborators (both internal and external to the municipal government structure) for the execution of projects of Smart type.

# 3. Manual of use of the tool

The tool designed for the IDB has been conceived as a practical **evaluation tool** with the aim of measuring the degree of Smart maturity of the cities. To facilitate its handling, this section details the functionalities of the tool, developed in Excel format, which has a main menu with **2 broad categories**:

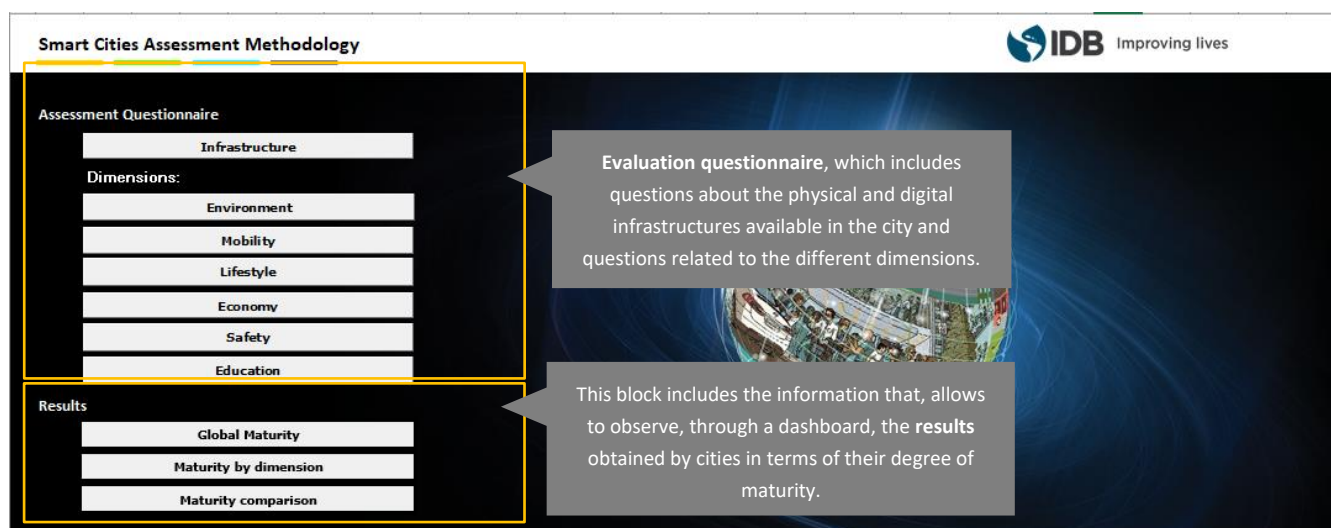
- Evaluation questionnaire.
- results.

The content and use of these drop-downs are described below:

## 3.1. Initial screen

In advance of the evaluation, it is necessary to indicate that the evaluation tool has been configured through a macro-enabled spreadsheet (XLSM file). For security reasons, Excel does not enable macros by default, so, in the case of opening the tool with this program, a warning message will appear under the toolbar that warns of this disablement and offers the option "Enable content" or "Enable content" to allow the execution of these. It will be necessary to click on this button to be able to use the tool without problems.

Once the tool is opened, the initial page or screen will be accessed, the content of which is described below. Thus, this initial screen offers us the global vision of the questionnaire to be carried out.



**Smart Cities Assessment Methodology**

**Assessment Questionnaire**

Infrastructure

Dimensions:

- Environment
- Mobility
- Lifestyle
- Economy
- Safety
- Education

**Results**

- Global Maturity
- Maturity by dimension
- Maturity comparison

**Callout 1:** Evaluation questionnaire, which includes questions about the physical and digital infrastructures available in the city and questions related to the different dimensions.

**Callout 2:** This block includes the information that, allows to observe, through a dashboard, the results obtained by cities in terms of their degree of maturity.

3.2. Evaluation questionnaire

In the first section of the tool you can access the evaluation questionnaire, which includes individualized instructions for each of the dimensions.

First, through the tool questions are asked about the **physical and digital infrastructures** available in the city and subsequently, after selecting and accessing each of the dimensions under evaluation, as indicated below, questions relating to the **dimensions** Concrete. In this sense, the answers can be of 4 types:

- Deployable:** possibility to filter and choose one of the options, for example: true or false; yes or no; different types of collaboration; etc.

1) Select the option that best defines the city's strategy

2) Identify the unit responsible for carrying out strategic planning and its execution in the dimension, regardless of whether it is developing Smart projects

There is no strategic planning

There is a strategic plan for the dimension, but the use of technology is not contemplated

Specific projects are developed in the dimension with application of technology

Technology is commonly used in the development of projects in the dimension


The dimension is part of a Smart plan at the city level

- Weightings:** ability to filter and choose a range among the weighted possibles.

Physical infrastructures

Question 1: Assess the degree of coverage, penetration and accessibility of the following infrastructures:

	Coverage	Penetration	Accessibility
<b>Servers</b>			
Own data center	<div></div>	<div></div>	<div></div>
	0% - 20%		
Remote server	21% - 40%	<div></div>	<div></div>
	41% - 60%		
<b>Wired connection</b>	61% - 80%		
	81% - 100%		
Copper	<div></div>	<div></div>	<div></div>
Optical fiber	<div></div>	<div></div>	<div></div>



- Free content:** white space to be filled with comments or information of interest that allows a sanity check by the evaluation team to validate the adequacy of the response.

What data is generated and collected?	
What analysis is done with this data?	

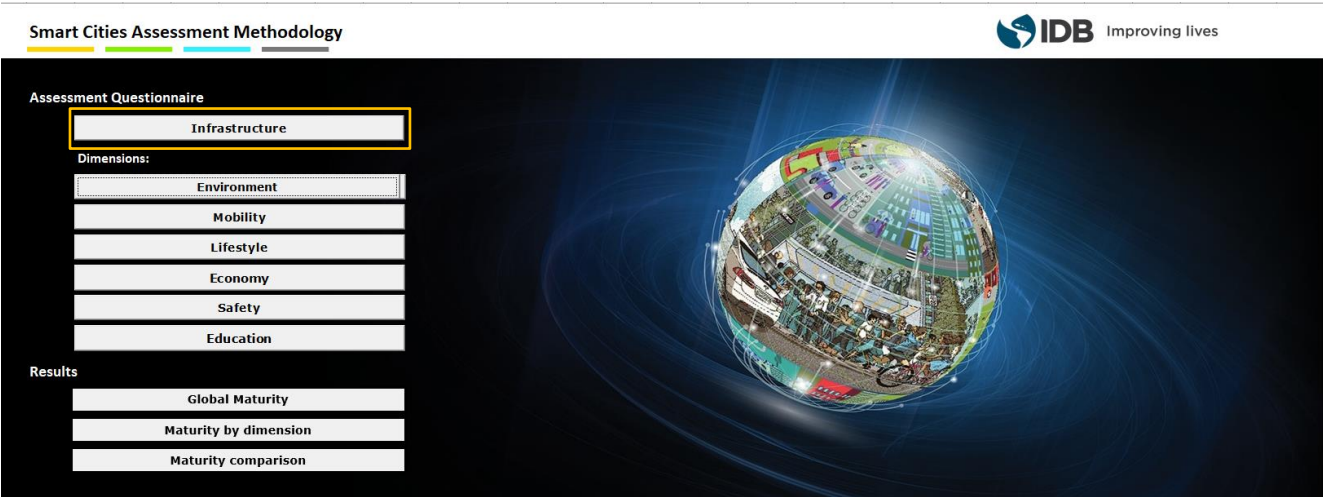
- **Multiple response:** Sometimes the same question will be answered with several types of combined answer of the 3 previous types.

Service 1: Management of the recycling center network			
	Degree of utilization (scale from 1 to 5)	Briefly describe how this particular solution is being adopted	Indicate the location in the city (when applicable)
Real-time data analytics	<div><div></div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div>	<div></div> <div></div>	<div></div> <div></div>

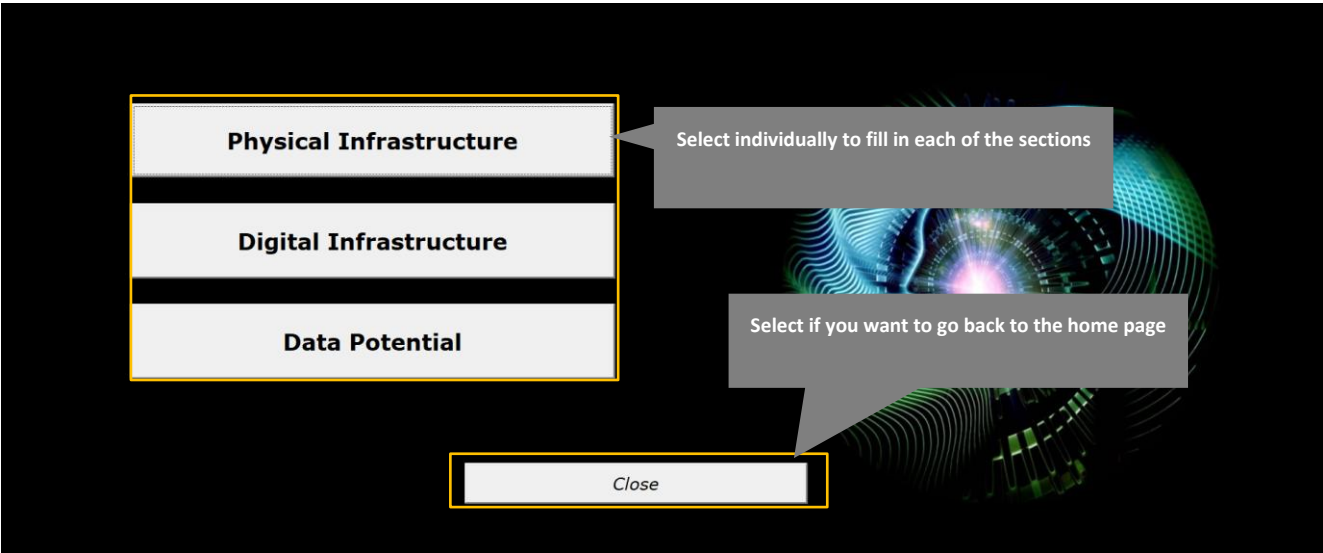
Below is the user manual focused on the different subsections within the evaluation questionnaire and their ephenicities.

3.1.1 Infrastructure

**Step 1.** We select the section of **Infrastructure**. In this regard, infrastructure questions should be answered at the city level and may be answered by staff from the city's IT department or another subnational or national government, as the case may be.



**Step 2.** A new window will be deployed with three categories: physical infrastructures, digital infrastructures and data potential.



**Step 3.** Below is the deployment of the "physical infrastructure" category. The use of buttons relating to this category apply in the same way in "digital infrastructures" and "data potential". It should be noted that the last category "data potential" includes free text questions, which will be completed by manually typing what is deemed necessary.



Infraestructuras físicas

**Physical infrastructures**

Question 1: Assess the degree of coverage, penetration and accessibility of the following infrastructures:

	Coverage	Penetration	Accessibility
<b>Servers</b>			
Own data center	<input type="text"/>	<input type="text"/>	<input type="text"/>
Remote server	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Wired connection</b>			
Copper	<input type="text"/>	<input type="text"/>	<input type="text"/>
Optical fiber	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Wireless connection</b>			
3G	<input type="text"/>	<input type="text"/>	<input type="text"/>
4G	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Last mile connection</b>			
Wi-Fi access points	<input type="text"/>	<input type="text"/>	<input type="text"/>

Select to return to the infrastructure screen

Select to clear responses

select **always** upon completion of the questionnaire. This will allow you to collect the marked answers

Clear

Save answers

Exit

Select to return to the initial screen

3.1.2 dimensions

Through the tool, the questionnaire evaluates for each of the dimensions: Environment, Mobility, Lifestyle, Economy, Security, and Education. In this sense, the Evaluation Questionnaire by dimensions is presented through the following visualization:

Smart Cities Assessment Methodology

IDB Improving lives

Assessment Questionnaire

Infrastructure

Dimensions:

- Environment
- Mobility
- Lifestyle
- Economy
- Safety
- Education

Results

- Global Maturity
- Maturity by dimension
- Maturity comparison

An example response will be made for the specific dimension of Environment, taking into account that the steps to be followed can be duplicated for all dimensions. If there are specificities, they will be mentioned at the end of this section.

**Step 1.** Select the specific dimension on the initial screen. A new window will open with the different evaluation categories:





**Step 2.** A new window will open with the questions for each of the categories. The typology of questions will vary according to the category. When selecting the category "**Capabilities**", the following window will open:

Medio Ambiente - Capacidades

### Vision and strategy

1) Select the option that best defines the city's strategy

2) Identify the unit responsible for carrying out strategic planning and its execution in the dimension, regardless of whether it is developing Smart projects

3) Is there any incorporation of the City Resilience concept into strategic planning?

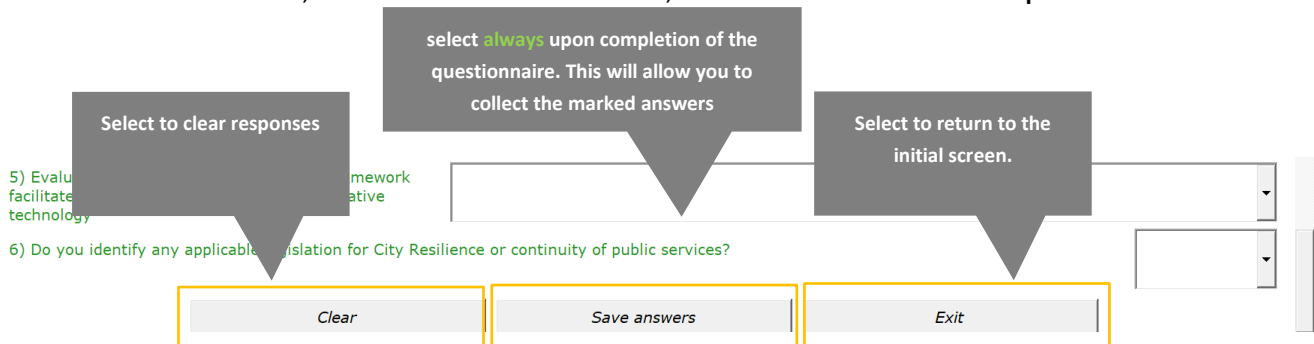
### Ecosystem

1) Indicate which other agents you identify are developing technological projects related to the dimension and indicate if you have collaborated with them:

	Do you identify that you have projects?	Have you collaborated with them?	Indicate the type of collaboration	If yes, describe the collaboration
a) Other level (state and national)	<div>Select to display the possible answers and select the option to be considered</div>		Open-ended questions. Fill in manually if applicable.	
b) Other municipal areas				
c) Big enterprises				

Scroll through the questions with the sidebar. You can drag the bar or scroll with the arrow keys on your keyboard.

**Step 3.** When you finish completing the answers, you will reach the end of the category. From here, there are three options. It should be borne in mind that, in order to consider the answers, it is essential to select **"Save responses"**.



select **always** upon completion of the questionnaire. This will allow you to collect the marked answers

Select to clear responses

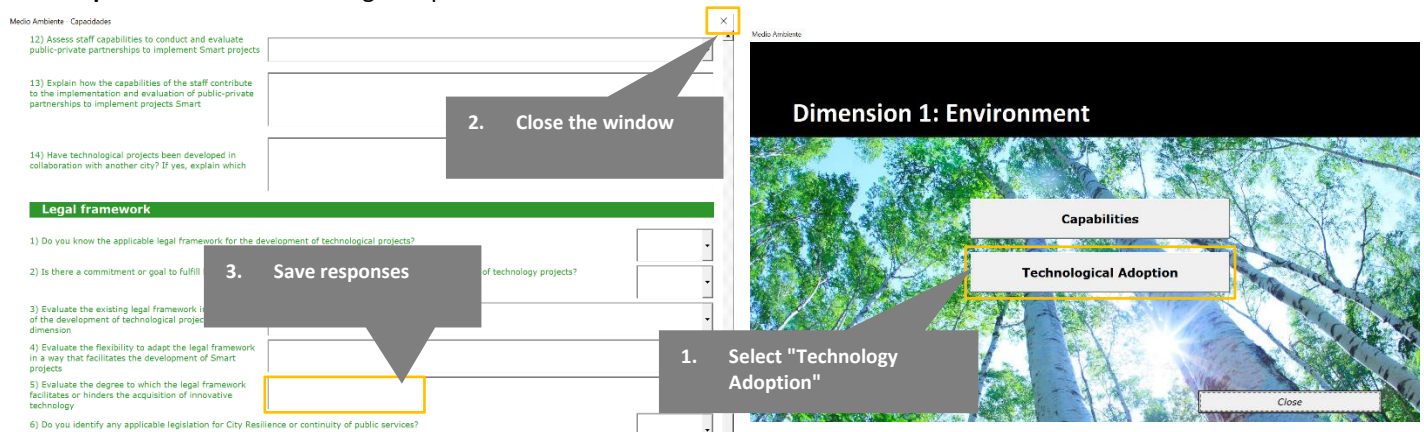
Select to return to the initial screen.

5) Evaluate the legal framework that facilitates the development of technology projects

6) Do you identify any applicable legislation for City Resilience or continuity of public services?

Clear Save answers Exit

**Step 4.** Select the "x" in the top corner of the window to return to the dimension categories. We select **"Technological adoption"** to continue solving the questionnaire.



Medio Ambiente - Capacidades

12) Assess staff capabilities to conduct and evaluate public-private partnerships to implement Smart projects

13) Explain how the capabilities of the staff contribute to the implementation and evaluation of public-private partnerships to implement projects Smart

14) Have technological projects been developed in collaboration with another city? If yes, explain which

2. Close the window

Legal framework

1) Do you know the applicable legal framework for the development of technological projects?

2) Is there a commitment or goal to fulfill the development of technology projects?

3. Save responses

3) Evaluate the existing legal framework in the development of technological projects dimension

4) Evaluate the flexibility to adapt the legal framework in a way that facilitates the development of Smart projects

5) Evaluate the degree to which the legal framework facilitates or hinders the acquisition of innovative technology

6) Do you identify any applicable legislation for City Resilience or continuity of public services?

1. Select "Technology Adoption"

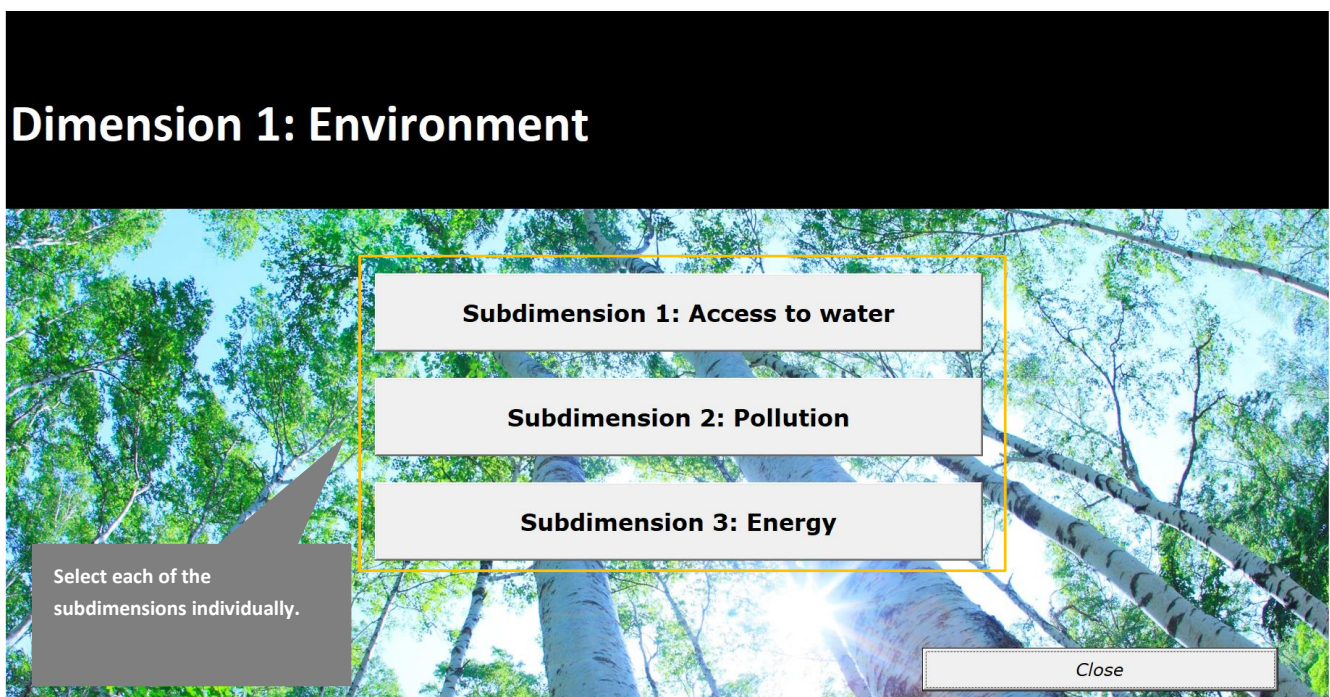
Dimension 1: Environment

Capabilities

Technological Adoption

Close

**Step 5.** Selecting "Technology Adoption" will display a new window with the subdimensions. We select the sub-dimension that we are going to fill in.



Dimension 1: Environment

Subdimension 1: Access to water

Subdimension 2: Pollution

Subdimension 3: Energy

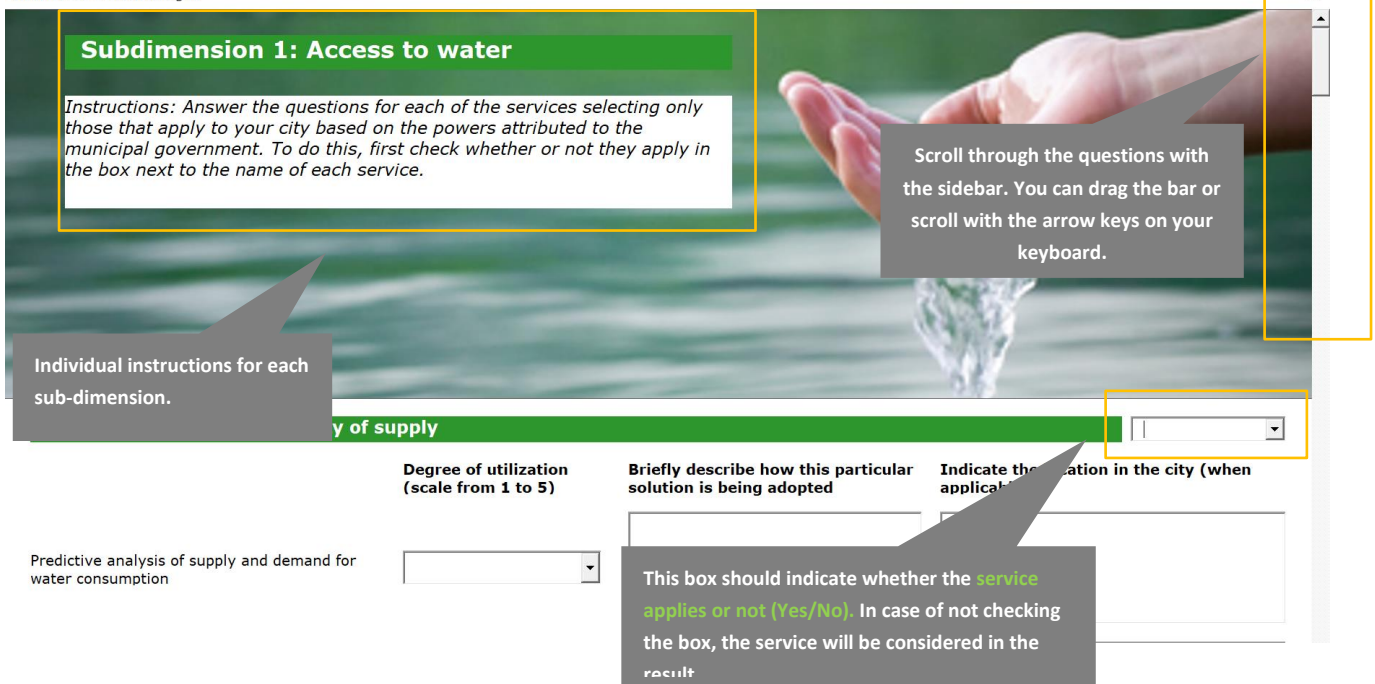
Select each of the subdimensions individually.

Close



**Step 6.** A new window will be displayed for each subdimension. In this sense, these subdimensions include the different services attributed to the municipal government. It is important to reflect whether or not those services apply in the box next to the name of each service. In case of not marking it, this service will be automatically included in the results.

Subdimensión 1: Acceso al agua



**Subdimension 1: Access to water**

*Instructions: Answer the questions for each of the services selecting only those that apply to your city based on the powers attributed to the municipal government. To do this, first check whether or not they apply in the box next to the name of each service.*

Scroll through the questions with the sidebar. You can drag the bar or scroll with the arrow keys on your keyboard.

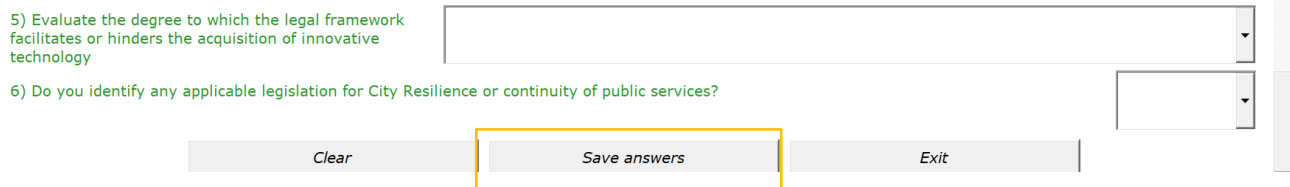
Individual instructions for each sub-dimension.

of supply

	Degree of utilization (scale from 1 to 5)	Briefly describe how this particular solution is being adopted	Indicate the applicability in the city (when applicable)
Predictive analysis of supply and demand for water consumption	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>

This box should indicate whether the **service applies or not (Yes/No)**. In case of not checking the box, the service will be considered in the result

**Step 7.** Finally, we select "Save the answers" once the information related to the corresponding sub-dimension is completed.



5) Evaluate the degree to which the legal framework facilitates or hinders the acquisition of innovative technology

6) Do you identify any applicable legislation for City Resilience or continuity of public services?

Clear Save answers Exit

**This procedure is replicable for all dimensions and subdimensions of the tool.**

## 3.3. Results

As mentioned above, the tool contains a block of global results that allows to observe, through a dashboard, the results obtained by the city in terms of its degree of maturity. In this sense, these results can be visualized from three perspectives:

1. **Maturity of the city:** it allows to visualize the global results by dimension, of the infrastructures, capacities and technological adoption.
2. **Maturity by dimension**—Displays maturity in the different dimensions.
3. **Maturity comparison:** makes a comparison between the dimensions.

### 1) Maturity of the city

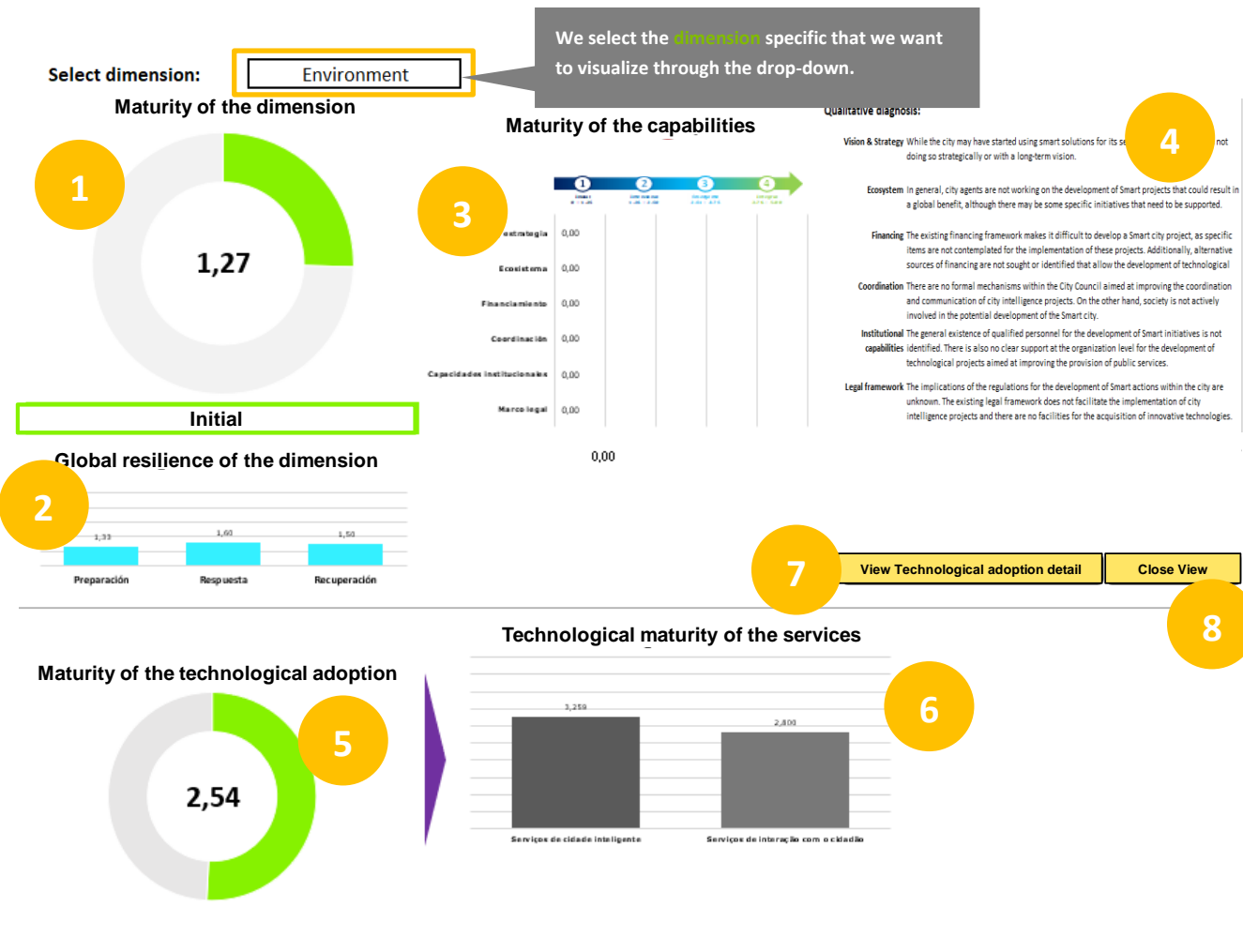


(The numbers indicate the functionalities detailed below the graphs in order to facilitate their explanation and understanding)

1. **Score of the degree of maturity and classification of the city according to its result** (initial, intentional, emergent or integral).
2. **Maturity by dimension:** Score obtained in each of the dimensions analyzed.
3. **Infrastructure maturity:** Score obtained in each of the categories of infrastructures analyzed.

4. **Maturity of capabilities:** Score obtained according to the capabilities analyzed.
5. **Level of maturity of technological adoption:** Overall score obtained according to the technological adoption of the city.
6. **Technological maturity of the services:** Scoring of smart city services and citizen interaction services.
7. **Close button to return to the home screen.**

## 2) Maturity by dimension



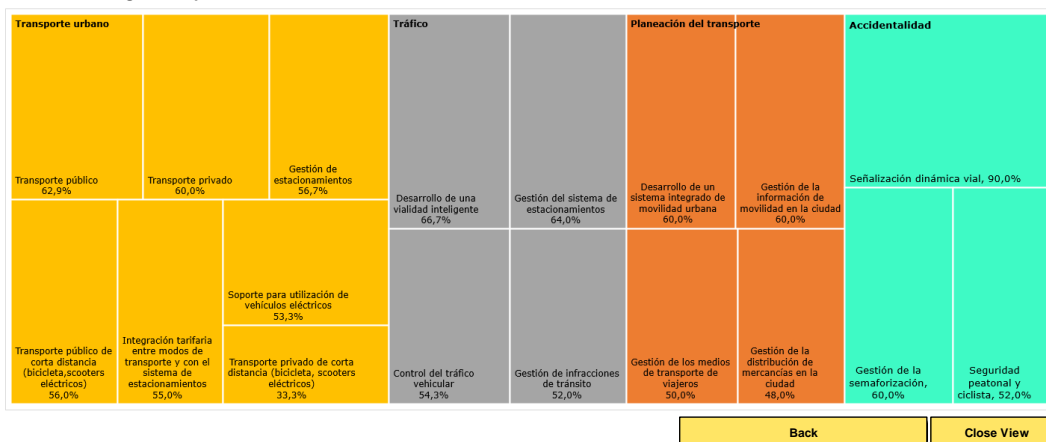
(The numbers indicate the functionalities detailed below the graphs in order to facilitate their explanation and understanding)

1. **Score of the degree of maturity of the specific dimension and classification of the city according to its result (initial, intentional, emergent or integral).**
2. **Score of the global resilience of the specific dimension according to the different stages of resilience: preparation, response and recovery.**
3. **Maturity of capabilities:** Score obtained according to the capabilities analyzed.
4. **Qualitative diagnosis of the capabilities:** Qualitative diagnosis of the city's capabilities.
5. **Level of maturity of technological adoption:** Overall score obtained according to the technological adoption of the city in the specific dimension.
6. **Technological maturity of services in the specific dimension:** Score of smart city services and citizen interaction services in the specific dimension.

7. **See detail of technological adoption:** Select to display a graph with the detail of technological adoption in each field.
8. **Close button to return to the home screen.**

Additionally, the view by dimension allows to obtain a greater detail of the development of its different subdimensions and services that compose them. Thus, at the bottom right of the dashboard, the "View technology adoption detail" button appears, which allows you to access this view:

Detail technological adoption of the dimension



### 3) Maturity comparison

	Environment	Mobility	Lifestyle	Economy	Safety	Education
Degree of maturity of the dimension	50	81	17	24	32	65
Capabilities	36	49	41	56	41	48
Vision & Strategy	65	87	22	78	26	23
Coordination	51	72	60	82	55	66
Institutional Capabilities	21	52	30	32	29	38
Legal framework	18	10	45	62	15	79
Ecosystem	47	34	43	31	79	66
Financing	12	41	46	51	43	16
Technological adoption	38	64	53	28	58	57
smart management	25	47	88	33	85	49
Interaction with the citizen	51	81	18	23	32	65
Resilience	33	45	34	48	64	51
Preparation	35	82	18	23	32	65
Response	13	22	45	56	98	57
Recovery	52	31	40	65	61	33

On this screen you can see a **comparison of scores** obtained by dimension.

## 4. Annexes

### Annex 1 - Catalogue of public services in the subdimensions

This annex contains the details of the services to be evaluated that are defined for each of the subdimensions of the city.

#### Dimension 1: Environment

Sub-dimension 1: Water access	Sub-dimension 2: Contamination	Sub-dimension 3: Energy
S1: Access and continuity of supply	s1: Management of the recycling centre network	S1: Information on environmental certifications for construction and operation of buildings
S2: Rainwater harvesting	S2: Road cleaning	S2: Information on energy efficiency and distributed generation
S3: Wastewater management	S3: Environmental footprint measurement	S3: Monitoring energy consumption in public buildings
S4: Rate management and collection control	S4: Carbon footprint measurement	
S5: Identifying points of loss in the network	S5: Measuring air quality	
S6: Maintenance of the drainage and distribution network	S6: Measuring noise levels	
S7: Improving efficiency in management and operation	S7: Trash	
S8: Water quality monitoring	S8: Solid waste treatment	
S9: Monitoring and measurement of the volume and pressure of water consumed		

#### Dimension 2: Mobility

Sub-dimension 1: Accidents	Sub-dimension 3: Traffic	Sub-dimension 4: Urban transport
S1: Semaphorization management	S1: Vehicular traffic control	S1: Parking management
S2: Pedestrian and cyclist safety	S2: Development of an intelligent road	S2: Management of unconventional modes such as <i>car-moto sharing</i>
S3: Dynamic road signs	S3: Traffic Violation Management	S3: Tariff integration between modes of transport and with the parking system
	S4: Toll Management	S4: Support for electric vehicle use
	S5: Parking system management	S5: Private transportation
		S6: Short distance private transport (bicycle, electric scooters)
		S7: Public transport
		S8: Short distance public transport (bicycleScooters electrical)
Sub-dimension 2: Transportation planning		
S1: Development of an integrated urban mobility system		
S2: Management of the distribution of goods in the city		
S3: Mobility information management in the city		
S4: Management of means of passenger transport		



### Dimension 3: Lifestyle

Sub-dimension 1: Social inclusion	Sub-dimension 2: Housing and urban development	Sub-dimension 3: Health
S1: Women's empowerment	S1: Conservation and rehabilitation of historical heritage	S1: Medical Emergency Alert
S2: Integration of women in the workplace	S2: Management of incidents of urban infrastructure and equipment	S2: Assistance to the elderly
S3: Active policies to eliminate violence and discrimination	S3: Management and maintenance of public infrastructure and urban equipment	S3: Care and inclusion of people with different abilities
S4: LGTBI Integration Service	S4: Monitoring the conservation status of urban infrastructure	S4: Scheduling Medical Appointments
S5: Services help to immigrants	S5: Detection, management and control of irregular settlements	S5: Social volunteering programs
S6: Monitoring the situation of children at risk of social exclusion	S6: Availability of information on urban planning and regulation in GIS	S6: Remote consultation and diagnostic services
S7: Support services in reducing exclusion	S7: Inclusive and comprehensive planning	S7: Grassroots social services
S8: Complementary social services	S8: Monitoring urban compliance	S8: Responding to health crises
	S9: Neighborhood Improvement Programs	S9: Care and response to patients in health crises
	S10: Sustainable urban development	
	S11: Green areas	

### Dimension 4: Economy

Sub-dimension 1: Local economic development	Sub-dimension 2: Digital governance	Sub-dimension 3: Tourism
S1: Promotion of the entrepreneurship local	S1: Access to public information	S1: Availability of tourist information
S2: Incentivising fair trade at local level	S2: Coordination between different levels and government agencies	S2: Offer of services for tourists
S3: Boosting business creation at the local level	S3: Assessing the quality and efficiency of digital governance services	S3: Planning the offer of services for tourists
S4: Support services for economic recovery in times of crisis	S4: Monitoring compliance with legal and fiscal obligations	S4: Safety for tourists
	S5: Citizen participation	S5: Entertainment services and digitized sightseeing tours
	S6: Processes of generation, monitoring and control of public procurement	S6: Aid to the tourism sector in times of crisis
	S7: Services, resources and infrastructure for innovation	S7: Online and digital tourism services

### Dimension 5: Security

Sub-dimension 1: Urban security	Sub-dimension 2: Resilience of the city
S1: Street lighting	S1: Availability of information about preventing and during a natural disaster
S2: Coordination with the private sector for the provision of public services	S2: Management of the response capacity of infrastructures to attend affected
S3: Coordination to combat local and federal crime	S3: Mapping critical infrastructure and developing risk atlases
S4: Selection and evaluation standards for public service providers	S4: Model of rescue and evacuation of citizens
S5: Command Center Implementation and Management	S5: Normal services
S6: Information about personnel providing services for the city	S6: Early warning systems
S7: Information and attention to the citizen	
S8: Surveillance systems	
S9: Systems for reporting and tracking incidents	

Dimension 6: Education

Sub-dimension 1: Talent	Sub-dimension 2: Educational infrastructure	Sub-dimension 3: Digital divide
S1: Talent acquisition and retention	S1: Technological endowment in municipal libraries	S1: Aid for access to technological infrastructure (Phones cell phones, PCs, Internet etc.)
S2: Adaptive training and education	S2: Technological endowment in municipal schools and institutes	S2: ICT skills for employment
S3: Fight against illiteracy	S3: Continuity of the educational service	
S4: Study aids	S4: Virtual learning systems	

## Annex 2 - Technological solutions catalogue

The technologies identified in each of the dimensions and subdimensions are presented below, as well as their categorization according to their ability to contribute to the different phases of the city's resilience process.

### Environment.

#### Sub-dimension 1: Water access

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 01.01.01: Access and continuity of supply</b>	Predictive analysis of water supply and demand consumption		X	X		
	Mobile apps with information about the status of the service		X	X	X	
	Databases for the management of service information		X	X	X	
	Incident management		X		X	X
	Sensors for monitoring incidents in the network		X		X	X
<b>Service 01.01.02: Rainwater harvesting</b>	Web portal with information on rainwater harvesting systems	X				
	Sensors	X				
	ERP-type solutions for asset management	X				
	Telemetry	X				
<b>Service 01.01.03: Wastewater management</b>	Real-time data analytics	X				
	Automated measurement infrastructure	X				
	Automated measurement reading	X				
	Data transmission network	X				
	Data storage systems	X				
	Data management systems	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Smart pressure reduction valves	X				
<b>Service 01.01.04: Fee management and collection control</b>	Data analytics for the configuration of different rates depending on consumption, quality, ability to access the service, etc.		X			
	Mobile apps to report on consumption and billing		X			
	Integration of water consumption collection with other city services		X			
	Payment platform		X			
	CRM-ERP solutions for the control of the relationship with water users and the available means		X			
<b>Service 01.01.05: Identification of loss points on the network</b>	Hydrometric districts	X				
	Ground penetrating radar	X				
	Sensors	X				
	Network loss alert systems	X				
	Satellite scanning technology	X				
	Smart pressure reduction valves	X				
<b>Service 01.01.06: Maintenance of the</b>	Hydrometric districts	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
drainage and distribution network	Platform for water distribution network data management	X				
	Sensors	X				
	Geographic Information System	X				
	Telemetry	X				
Service 01.01.07: Improving efficiency in management and operation	Real-time data analytics	X				
	Automated measurement infrastructure	X				
	Automated measurement reading	X				
	Water recycling: CO2 sinks, water treatment by vegetation, etc.	X				
	Data transmission network	X				
	Storage system	X				
	Data storage systems	X				
	Data management systems	X				
	Smart pressure reduction valves	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 01.01.08: Water quality monitoring</b>	Real-time data analytics	X				
	Mobile apps	X				
	Computerized telemetry devices	X				
	Nanotechnology	X				
	Sensors	X				
	Photonic systems for measuring water quality	X				
	Geopositioned visualizations on water quality	X				
<b>Service 01.01.09: Monitoring and measurement of the volume and pressure of water consumed</b>	Real-time data analytics	X				
	Automated measurement infrastructure	X				
	Automated measurement reading	X				
	Data transmission network	X				
	Data storage systems	X				
	Data management systems	X				
	Smart pressure reduction valves	X				
	Geopositioned visualizations on the volumes of water consumed	X				

## Sub-dimension 2: Pollution

Service	Rechnology	Service type		resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 01.02.01: Network management of recycling centres</b>	Real-time data analytics	X				
	Mobile apps	X				
	Wireless communications	X				
	Platforms	X				
	Clean points network	X				
	Radio frequency identification systems	X				
	Location systems	X				
	Weighing systems	X				
	Specialized software	X				
<b>Service 01.02.02: Road cleaning</b>	Real-time data analytics	X				
	Mobile apps	X				
	Wireless communications	X				
	Platforms	X				
	Radio frequency identification systems	X				
	Location systems	X				
	Weighing systems	X				
	Specialized software	X				
<b>Service 01.02.03: Environmental</b>	Real-time data analytics	X				



Service	Rechnology	Service type		resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
footprint measurement	Mobile apps	X				
	Bioindicators and biosensors	X				
	Platforms	X				
	Data storage systems	X				
	Data management systems	X				
	Specialized software	X				
Service 01.02.04: Carbon footprint measurement	Real-time data analytics	X				
	Mobile apps	X				
	Bioindicators and biosensors	X				
	Platforms	X				
	Data storage systems	X				
	Data management systems	X				
	Specialized software	X				
Service 01.02.05: Air quality measurement	Real-time data analytics	X				
	Automated analyzers and particle monitors	X				
	Apps with data on air quality in the city	X				
	Active samplers (electrical energy)	X				
	Passive samplers (not electrical power)	X				
	Data transmission network	X				

Service	Rechnology	Service type		resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Remote sensors	X				
	Data management systems	X				
	Geopositioned visualizations on air quality	X				
Service 01.02.06: Measuring noise levels	Real-time data analytics	X				
	App for the transmission of complaints	X				
	Acoustic cameras	X				
	Acoustic maps	X				
	Specialized software	X				
Service 01.02.07: Waste collection	Real-time data analytics	X				
	Mobile apps	X				
	Wireless communications	X				
	Smart containers	X				
	Platforms	X				
	Radio frequency identification systems	X				
	Location systems	X				
	Weighing systems	X				
	Specialized software	X				
Service 01.02.08: Solid waste treatment	Real-time data analytics	X				

		Service type		resilience		
Service	Rechnology	Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Mobile apps	X				
	Wireless communications	X				
	Smart containers	X				
	Platforms	X				
	Weighing systems	X				
	Specialized software	X				

### Sub-dimension 3: Energy

Service	Technology	Service type		resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 01.03.01:</b> Information on environmental certifications for construction and operation of buildings	Enforcement of environmental legislation		X			
	Mobile apps		X			
	Built-in databases		X			
	Self-managing wireless devices for measurement: gateways, end nodes, routers		X			
	Internet sites		X			
<b>Service 01.03.02:</b> Information on energy efficiency and distributed generation	Energy Storage through Hydrogen		X			
	Implementation of energy efficiency regulations		X			
	Mobile apps		X			

Service	Technology	Service type		resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Built-in databases		X			
	Self-managing wireless devices for measurement: gateways, end nodes, routers		X			
	Energy Management System (EMS)		X			
	Internet sites		X			
	Energy recovery of waste		X			
<b>Service 01.03.03: Monitoring energy consumption in public buildings</b>	Devices / Mobile Apps	X				
	Real-time meters of electrical energy consumed	X				
	Centralized energy consumption management platform	X				
	Sensors	X				
	Satellite technology	X				

## Mobility.

### Sub-dimension 1: Accidents

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
<b>Service 02.01.01: Semaphorization management</b>	Surveillance cameras	X				
	Traffic Control Center	X				
	Smart Semaphorization (RFID)	X				
	Smart semaphorization controlled by artificial intelligence in real time	X				
	Semaphorization for scheduled vehicles and pedestrians	X				
<b>Service 02.01.02: Pedestrian and cyclist safety</b>	APP for location and mapping of safe cycling routes	X		X		
	Surveillance cameras	X		X		
	Surveillance cameras at crosswalks	X		X		
	Digital infrastructure for vehicle detection for safe crossings	X		X		
	Systems for measuring pedestrian traffic density	X		X		
<b>Service 02.01.03: Dynamic road signs</b>	App for warning of incidents related to accidents within the road network	X			X	X
	Surveillance cameras	X		X		
	Speed information panels in a preventive manner in areas at risk of accident	X		X	X	
	Speed control panels	X		X		
	Electronic signaling with variable messages	X			X	
	Traditional road network signage	X		X		

## Sub-dimension 2: Transportation planning

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 02.02.01: Development of an integrated urban mobility system</b>	Traffic monitoring algorithms and systems		X			
	CRM-ERP type applications for the development of the integrated urban mobility system		X			
	Databases for storage and predictive demand analysis		X			
	Platforms and technologies that facilitate transactionality in the collection of trips		X			
	Single integrated ticket/subscription management system		X			
	Integrated route planning systems		X			
<b>Service 02.02.02: Management of the distribution of goods in the city</b>	Pilots promoting autonomous vehicles for freight delivery	X				
	Vehicle identification system with loading and unloading permits, registration of shares, information to the registered company, etc.	X				
	Detection systems for nearby loading and unloading areas	X				
	Systems for the promotion of electric or hybrid vehicles for the transport of goods	X				
	Integrated route planning systems	X				



Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 02.02.03: Management of mobility information in the city</b>	Integration of means of transport in a single database (traffic, metro, BRT, taxis, bicycles, etc.)	X		X		
	Use of analytics for the planning / operation of the mobility network	X		X	X	X
	Use of artificial intelligence for the planning / operation of the mobility network	X		X	X	X
<b>Service 02.02.04: Means of passenger transport management</b>	Specialized system for passenger transport planning		X			
	Use of Artificial Intelligence for dynamic optimization of passenger transport		X			

### Sub-dimension 3: Traffic

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 02.03.01: Vehicular traffic control</b>	Predictive analytics for the establishment of behavior patterns and forecast of reinforcement actions for traffic control	X		X		
	Application with information about traffic status	X			X	X
	Databases for traffic information management	X		X	X	X
	Security cameras	X		X	X	
	Integrated vehicular traffic control center	X		X	X	X
	Urban congestion monitoring (real time)	X			X	
	Sensors for the detection of traffic congestions	X			X	
<b>Service 02.03.02: Intelligent road development</b>	App for road incident warnings	X			X	
	Signage with variable messages through an analytics and artificial intelligence system	X			X	X
	Pedestrian and road traffic monitoring and management systems	X		X	X	
<b>Service 02.03.03: Traffic violation management</b>	Automatic collection through account integration	X				
	Speed control radars	X				
	Sensors and systems for detecting road violations	X				
	CRM-ERP solutions for managing relationships with offenders	X				
	Use of drones for the detection of road violations in random locations	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 02.03.04: Toll management</b>	Automatic collection through account integration	X				
	CRM-ERP solutions for the management of relationships with users according to profiles	X				
	Integrated travel fares through a virtual app/wallet	X				
	Dynamic hourly rates	X				
	Variable rates by demand and user profile (identification system of vehicles / people residing, disabled etc.)	X				
<b>Service 02.03.05: Parking system management</b>	Application for parking meter payment	X				
	Conventional parking meters	X				
	Digital parking meters	X				
	Bicycle parking management system	X				
	Systems for parking location / available spaces	X				

#### Sub-dimension 4: Urban transport

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	preparation	Response	Recovery
<b>Service 02.04.01: Parking management</b>	Applications with information about available parking spaces	X				
	Integration of payments in publicly owned parking lots	X				
	Mapping of existing parking lots in the city	X				
	Platform for parking management	X				
	Sensors for detecting available/occupied parking lots	X				
	CRM-ERP solutions for managing relationships with users and available assets	X				
<b>Service 02.04.02: Management of unconventional modes such as car-motorcycle sharing</b>	Applications with information on unconventional modes of transport	X				
	Databases for the control of unconventional means of transport (e.g. shared transport)	X				
	Monitoring the use of unconventional modes of transport	X				
	Promotion of the use of non-conventional modes of transport	X				
<b>Service 02.04.03: Tariff integration between modes of transport and parking system</b>	Applications for location and management of public parking (reservations, cost visualization)		X			
	Coverage of parking centers within the city		X			

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	preparation	Response	Recovery
	Interoperability between urban collection systems		X			
	Parking reservation system		X			
<b>Service 02.04.04: Support for use of electric vehicles</b>	Mobile apps for the location of available stands/charging points		X			
	Carsharing with electric vehicles		X			
	Coverage of charging centers within the city		X			
	Promotion of the use of electric vehicles with lower consumption and pollution		X			
	Digital system of incentives for the use of electric vehicles		X			
	Location and parking management systems for electric vehicles		X			
<b>Service 02.04.05: Private transport</b>	Application of urban mobility with options for different means of private transport (motorcycles, cars, bicycles, scooter, pedestrian)	X				
	Integrated application for the management of private alternative transport systems	X				
	Application for integrated transport and taxi options management (taxi and VTC)	X				
	Applications for shared transport	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	preparation	Response	Recovery
	Public management portal of private providers of alternative means of transport (scooters, cars, bicycles, segways) for obtaining permits, management, support and inclusion in mobility applications	X				
	Information portals, guidelines, and usage policies	X				
<b>Service 02.04.06: Short distance private transport (bicycle, electric scooters)</b>	Databases for the management of information of short-distance private transport in the city	X				
	Promotion of the use of short-distance private means of transport	X				
	Promotion of the use of short-distance private transport and facilities for its acquisition	X				
<b>Service 02.04.07: Public transport</b>	Applications for route planning with public transport	X				
	Databases for the management of public transport vehicle fleet information	X				
	Tools and/or applications for the collection of urban transport fares	X				
	Renewal plan of the public transport fleet and vehicle fleet	X				
	Fleet management platform	X				
	Public transport information portal	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	preparation	Response	Recovery
	Promotion of the use of cleaner fuels in the public fleet	X				
<b>Service 02.04.08: Short distance public transport (bicycle, electric scooters)</b>	Applications for route planning with short-distance public transport	X				
	Databases for the management of information on the fleet of short-distance public transport vehicles	X				
	Fleet management platform	X				
	Short-distance public transport information portal	X				
	Promotion of the use of short-distance public transport	X				

Lifestyle.

Sub-dimension 1: Social inclusion and diversity

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
<b>Service 03.01.01: Women's empowerment</b>	App with information for women (associations, movements, support initiatives...)		X			
	Newsletters		X			
	Network of women's care centres		X			
	Subscription system		X			
	Information sites to promote women's associations		X			
	Information sites on affective-sexual health		X			
	CRM-ERP solutions for managing relationships with women in the city		X			
	Women's helpline		X			
<b>Service 03.01.02: Women integration in the workplace</b>	Applications that allow access to content on the prevention of occupational risks		X			
	Newsletters		X			
	Cloud computing, Big data		X			
	Subscription system		X			
	Pay gap monitoring systems		X			



service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	Sites with awareness-raising and sensitization-raising content		X			
	Meeting places for women entrepreneurs		X			
<b>Service 03.01.03: Active policies to eliminate violence and discrimination</b>	Algorithms for identifying trends in the expression of violence and discrimination	X				
	App that allows victims of violence to contact social guardians	X				
	Newsletters	X				
	Panic buttons	X				
	Cloud computing, Big data	X				
	Interoperability with city security services	X				
	Smart conversation monitoring	X				
	Observatory of gender-based violence	X				
	Training digital portals to prevent technological attacks	X				
	Subscription system	X				
	Reporting/complaint systems	X				

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
<b>Service 03.01.04: LGBTI Integration Service</b>	Newsletters		X			
	Cloud computing, Big data		X			
	Social Networks		X			
	Subscription system		X			
	Sites with awareness-raising and sensitization-raising content		X			
	Information sites for LGBTII tourists		X			
<b>Service 03.01.05: Immigrant population services</b>	Database/CRM for recording the relationship with the immigrant population		X			
	ERP for aid management		X			
	Appointment management program		X			
	Service of alerts of programs, aids and job offers		X			
<b>Service 03.01.06: Monitoring the situation of minors at risk of social exclusion</b>	Advanced analytics for identifying vulnerability situations		X			
	CRM for case registration		X			
	ERP for the management of aids and files		X			

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	Alert systems to warn of programs and aids		X			
<b>Service 03.01.07: Support services for the reduction of exclusion</b>	CRM for exclusion case management		X			
	ERP for the management of programs, files and aids		X			
	Alert system		X			
	Advanced analytics systems for the detection of vulnerability situations		X			
<b>Service 03.01.08: Complementary social services</b>	CRM for case management		X			
	ERP for the management of grants and subsidies		X			
	Warning systems		X			

## Sub-dimension 2: Housing and urban development

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
<b>Service 03.02.01: Conservation and rehabilitation of historical heritage</b>	Mobile applications for the reporting of incidents by citizens	X				
	Urban topography databases	X				
	Cloud computing, Big data	X				
	Smart materials	X				
	virtual reality	X				
	Sensorization and monitoring of infrastructures for proper management of the city (real-time monitoring)	X				
	Tele-operated system	X				
	Three-dimensional modeling systems	X				
	Systems for obtaining historical information	X				
	Digital reconstruction systems	X				
<b>Service 03.02.02: Management of incidents of urban</b>	Surveillance cameras		X			

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
infrastructure and equipment	Cloud computing, Big data		X			
	Sensors		X			
	Incident detection systems (fires, leaks, etc.)		X			
	Reporting/complaint systems		X			
Service 03.02.03 Management and maintenance of public infrastructure and urban equipment	Surveillance cameras	X				
	Cloud computing, Big data	X				
	Equipment and processes that make construction more efficient	X				
	Inmotics (Building Management System)	X				
	Smart materials (such as mechanical stress, temperature, humidity, pH, or electric or magnetic fields)	X				

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	Integrated technological platform for capturing information from vertical systems in the fields of water, energy, mobility, waste, buildings to centralize information and manage infrastructures intelligently	X				
	Sensorization and monitoring of infrastructures for proper management of the city (real-time monitoring)	X				
	Information systems and data collection	X				
	Reporting/complaint systems	X				
<b>Service 03.02.04: Monitoring the state of conservation of urban infrastructure</b>	Surveillance cameras	X				
	Cloud computing, Big data	X				
	Sensors	X				
	Information collection and analysis systems	X				
	Reporting/complaint systems	X				
<b>Service 03.02.05: Detection, management and</b>	Drones	X				

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
control of irregular settlements	Satellite monitoring	X				
	Sensors for restricted areas (natural parks, special security zones, etc.)	X				
	Coordination systems between protection agencies	X				
	Reporting/complaint systems	X				
Service 03.02.06: Availability of information on urban planning and regulation in GIS	Urban infrastructure information database		X			
	Internet of Things		X			
	Monitoring resource use		X			
	Portal with georeferenced information		X			
	ERP-type solutions for the management of city assets		X			
Service 03.02.07: Inclusive and	Citizen participation initiatives in urban planning		X			

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
comprehensive planning	Urban Planning Information Portal		X			
	Augmented reality		X			
Service 03.02.08: Monitoring compliance with urban regulations	Citizen communication app for incidents, complaints and non-compliances	X				
	Surveillance cameras	X				
	Drones	X				
	Sensors	X				
	Satellite Technology	X				
Service 03.02.09: Programs for the improvement of neighborhoods	Energy storage	X				
	Intelligent lighting {new light sources (LED technology, photonic technology); hybrid systems; electricity generated by waste fraction, etc.}	X				
	ICT education centres, implementation of sensors (lighting, sanitation etc.)	X				
	Smart meters	X				
	District Heating & Cooling	X				
	Equipment and processes that make construction more efficient	X				



service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	Smart materials (such as mechanical stress, temperature, humidity, pH, or electric or magnetic fields)	X				
	Nearly Zero Energy Building	X				
	Sensorization and monitoring of infrastructures for a correct management of the city (in real time)	X				
	Data collection and information analysis systems	X				
	Infrastructure resilience testing systems for natural disasters	X				
	3D virtual reality systems and software for drawing up plans	X				
Service 03.02.10: Sustainable urban development	IoT and sensors	X		X	X	X
	Smart city platform	X		X	X	X
	Intelligent lighting systems	X			X	X
	Management systems and data analysis (Big Data)	X		X	X	X
	Geographic Information Systems	X		X	X	X
	Telemetry systems for monitoring resource consumption	X		X	X	
	Software for incident management	X			X	X
Service 03.02.11 Green areas	App for incident management	X				
	App for the management of reservations of use of common areas	X				

		Service type		resilience		
service	technology	Smart City Services	Citizen interaction services	preparation	answer	recovery
	IoT and sensórica	X				
	Advanced image processing systems	X				
	Irrigation management systems	X				
	Telemetry systems for monitoring resource consumption	X				

### Sub-dimension 3: Health

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 03.03.01: Medical Emergency Alert</b>	Mobile apps with GPS for location/ contact of emergency services		X	X	X	
	Panic button		X		X	
	Wearable technology (bracelets, watches, etc.) that allows to directly alert the emergency services		X		X	
<b>Service 03.03.02: Assistance to elderly people</b>	Call Center		X			
	Interoperability of Electronic Social Record systems with Clinical Record systems		X			
	Portal with information on assistance to the elderly		X			
	Regulation of Electronic Social History		X			
	Data protection systems		X			
	CRM-ERP solutions for the management of relationships with elderly citizens receiving assistance		X			
	Wearable technology for seniors that allows you to directly alert healthcare services		X			
<b>Service 03.03.03: Care and inclusion of people with disabilities</b>	Mobile apps with GPS for emergency contact tracing	X				
	Spoken language devices for people who can't express themselves	X				
	Guidance system (apps that allow the layout and guidance of routes accessible on maps)	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Auditory and sensory systems in tourist sites / transport	X				
	Public transport access systems for people with motor disabilities	X				
	Monitoring systems in learning	X				
<b>Service 03.03.04: Scheduling medical appointments</b>	Mobile apps		X			
	Integrated call centers		X			
	Cloud computing, Big data		X			
	Computers/Tablets in clinics		X			
	Augmented reality		X			
	Digital registry		X			
	Internet sites with management and administration of schedules		X			
<b>Service 03.03.05: Social volunteering programs</b>	Digitized centers for the coordination of social volunteering initiatives		X			
	Platforms for the exchange of experiences		X			
	Portal with information on social volunteering programs		X			

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	CRM-ERP solutions for the management of social volunteering programs		X			
Service 03.03.06: Remote consultation and diagnostic services	Digital appliances and equipment (e.g. basic: scale)		X			
	Mobile Applications (e.g.: Retinal Photodetection)		X			
	Shared Diagnostics App		X			
	Cloud computing, Big data		X			
	Integrated photonics, optical interconnections, ultrafast communication networks and increased bandwidth		X			
	Smart interfaces		X			
	Online Patient Portal		X			
	Systems for locating risk groups		X			
	Patient visualization and diagnostic software using digitized sensors		X			
	Techniques and devices for early measurement of parameters related to the appearance of pathologies		X			
	Teleoperation with robots		X			
	Integrated call centers		X			

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 03.03.07: Basic social services</b>	Cloud computing, Big data		X			
	Computers/Tablets in social service facilities		X			
	Digital registry		X			
	Internet sites with social services appointment management and management		X			
	CRM-ERP solutions for the management of relationships with citizens receiving grassroots social services		X			
<b>Service 03.03.08: Response to health crises</b>	Advanced predictive analytics of the evolution of contagions	X		X	X	X
	Infrared cameras for massive temperature readings	X			X	
	QR codes for monitoring space usage	X			X	X
	Drones for crowd control	X			X	X
	Geolocation of affected	X			X	X
	3D printing for medical materials	X		X	X	X
	Infection monitoring and traceability systems	X			X	
<b>Service 03.03.09: Care and response to patients in health crises</b>	Self-diagnosis app	X			X	
	Voluntary contagion information app	X			X	X
	Information and alerts app	X		X	X	X

# Economy.

## Sub-dimension 1: Local economic development

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 04.01.01: Promotion of local entrepreneurship</b>	ERP for the management of programs and aid to entrepreneurship	X				
	Platforms [YouTube type] for the dissemination of content	X				
	Social networks for entrepreneurs and investors	X				
	Storage systems	X				
	Relevant information/news distribution systems	X				
	Reservation systems for coworking spaces	X				
	Subscription systems	X				
	Internet sites with informative content (new projects, regulation, etc.)	X				
<b>Service 04.01.02: Incentivising fair trade at local level</b>	Fair trade app (location of shops in the city, relations and communications between merchants and consumers, etc.)	X				
	ERP for the management of programs and aid to local trade	X				
<b>Service 04.01.03: Boosting the creation of</b>	Research and Technology Centers	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
companies at the local level	Entrepreneurship platform (information, contests, grants, etc.)		X			
	Digital platforms for resource capture	X				
	Application/registration systems for new startups	X				
Service 04.01.04: Support/support services for economic recovery in times of crisis	ERP for program management and recovery aids		X	X		X
	Platform of aid to the reactivation (web with management of loans or consumer bonds)		X		X	X



## Sub-dimension 2: Digital governance

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 04.02.01: Access to public information</b>	Mobile applications with information finder		X			
	Call centers		X			
	Chatbot / Virtual Assistant		X			
	Internet transparency portals		X			
	Regulation of the right of access to information		X			
	Citizen fraud detection systems / improper use of information		X			
	CRM-type solutions for the management of relationships with citizens		X			
<b>Service 04.02.02: Coordination between different levels and government agencies</b>	Cloud Computing	X		X	X	X
	Standardization and data management strategy	X		X	X	X
	Software engineering (interoperability between databases, etc.)	X		X	X	X
	Digital portals with informative content (news, plans to be executed, guidelines)	X		X	X	X
	Internal communication systems (e.g. Skype for Business, etc.)	X		X	X	X

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Data Management Systems (Big Data)	X		X	X	X
<b>Service 04.02.03: Evaluation of the quality and efficiency of digital governance services</b>	Mobile applications with assessments of the quality and efficiency of services	X				
	Cloud computing	X				
	Definition of a mechanism for assessing the quality and efficiency of digital services (dashboards)	X				
	Internet portals with assessments of the quality and efficiency of services	X				
	Digital portals with mailbox of complaints and suggestions	X				
<b>Service 04.02.04: Monitoring compliance with legal and fiscal obligations</b>	Legal databases		X			
	Chatbot / Virtual Assistant		X			
	Models of citizens' behaviour		X			
	Platforms shared between authorities-company with informative content		X			
	Online government portals for the dissemination of legal and tax obligations		X			

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Digital process automation system (tax calculations, etc.) [ERPs]		X			
	Financial information collection and storage software		X			
	CRM-type solutions for the management of relationships with citizens		X			
	Tax Analytics		X			
<b>Service 04.02.05: Citizen participation</b>	Blogs / discussion and discussion pages		X			
	Chatbot / Virtual Assistant		X			
	Planning of specific participation initiatives (participatory budgets, idea contests, etc.)		X			
	Information portal on activities		X			
	Digital portals with mailbox of complaints and suggestions		X			
	Regulation of the right of citizen participation		X			
	Software / Information Inquiries and Requests Pages		X			
	CRM-type solutions for the management of relationships with citizens		X			
<b>Service 04.02.06: Processes of generation, monitoring and control of public procurement</b>	Smart databases	X				
	Contract management system	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Data storage systems	X				
	Regulatory monitoring systems	X				
	CRM-ERP solutions for the management of relationships with service providers	X				
<b>Service 04.02.07: Services, procedures and digital payments</b>	Digital / Mobile Applications for the realization of procedures		X			
	Call centers for the guide and consultation of information regarding procedures		X			
	Chatbot / Virtual Assistant		X			
	Regulation and regulation adapted for digital payments		X			
	eGovernment Services		X			
	Data Management Systems (Big Data)		X			
	Integrated document storage systems		X			
	CRM-type solutions for the management of relationships with citizens		X			

### Sub-dimension 3: Tourism

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
<b>Service 04.03.01: Availability of tourist information</b>	Mobile apps		X			
	Target support app (forecasting; scheduling; routing)		X			
	App for currency exchange without commissions		X			
	Content sponsored and suggested to tourists via algorithms		X			
	Smart interfaces		X			
	Digital portals in resorts		X			
	Electronic points of sale (EPOS System)		X			
	Simulation and visualization		X			
	Tourist Destination Management System (DMS)		X			
	Intelligent transport systems - ITS in the urban environment		X			
	Internet sites		X			
<b>Service 04.03.02: Offer of services for tourists</b>	Mobile apps with tourist information	X				
	Augmented Reality Solutions	X				

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	ERP-type solutions for tourism infrastructure management	X				
Service 04.03.03: Planning the offer of services for tourists	Analytics for the planning of the tourist offer	X				
	Databases on tourism infrastructure	X				
	Use of ICT to collect information on tourism demand	X				
Service 04.03.04: Security for tourists	Tourist applications with contact with police or emergency services		X			
	Monitoring crowds at hotspots		X			
	Multi-language incident warning system in tourist applications		X			
Service 04.03.05: Entertainment services and digitized sightseeing tours	Mobile apps		X			
	Cloud computing, Big data		X			
	Virtual reality glasses and augmented reality systems		X			
	Robotic tour guides		X			
	Smart / interactive museums		X			

service	technology	Service type		resilience		
		Smart City Services	Citizen interaction services	preparation	answer	recovery
	Personalised recommendation System		X			
	Simulation and visualization		X			
	Guidance system (accessibility)		X			
	Tourist transport systems (e.g. Turibus) with automated audio system		X			
<b>Service 04.03.06: Aid to the tourism sector in times of crisis</b>	ERP for program management and recovery aids		X	X		X
	Platform of aid to the reactivation (web with management of loans or consumer bonds)		X		X	X
<b>Service 04.03.07: Online and digital tourism services</b>	Early booking mechanisms	X			X	X
	Capacity monitoring	X			X	
	Tourist information platform/app	X		X	X	X
	Streaming cultural events	X			X	
	Virtual visits to museums, monuments and historical buildings	X			X	

Safety.

Sub-dimension 1: Urban security

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 05.01.01: Public lighting</b>	Data analytics	X				
	Automation	X				
	Surveillance cameras	X				
	Wireless communications	X				
	Home automation and inmotics	X				
	Internet of Things	X				
	Control nodes	X				
	Centralized city lighting management platform	X				
	Motion sensors	X				
	LED technology	X				
<b>Service 05.01.02: Coordination with the private sector for the provision of public services</b>	Data analytics	X				
	Information exchange systems	X				
	Specialized software	X				
	CRM-type solutions for managing relationships with private sector agents	X				



Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
Service 05.01.03: Coordination for the fight against local and federal crime	Special identification algorithms	X				
	Data analytics	X				
	Cameras	X				
	Wireless communications	X				
	Drones	X				
	Plate scanners	X				
	Internet of Things	X				
	Interoperability with federal security information systems	X				
	Augmented reality	X				
	Facial recognition systems	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 05.01.04: Selection and evaluation standards for personnel providing public services</b>	Data analytics	X				
	Specialized software for the management of personnel providing public services	X				
<b>Service 05.01.05: Implementation and management of command centers</b>	Data analysis for crime prevention	X		X		
	Mobile apps	X		X	X	X
	Cybersecurity	X		X	X	X
	Management of incidents en route	X			X	X
	Geospatial modeling	X		X	X	
	Platform for security management data integration	X		X	X	X
	Fixed networks	X		X	X	X
	Information exchange systems	X		X	X	X
	Traceability (location)	X		X	X	X
<b>Service 05.01.06: Information about personnel</b>	Call Centers	X				

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
providing services for the city	Cybersecurity	X				
	Corporate intranet	X				
	Platform for the integration of data of the personnel who provide services for the city	X				
	Public information portal	X				
Service 05.01.07: Information and attention to the citizen	Special identification algorithms		X	X	X	
	Mobile apps		X	X	X	X
	Call Centers		X		X	X
	Identification, tracking and location of crime zones		X	X	X	
	Internet of Things		X	X	X	X
	Mobile networks		X	X	X	X
	Physical security and its systems		X	X	X	X

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	CRM-type solutions for the management of relationships with citizens		X	X	X	X
<b>Service 05.01.08: Surveillance systems</b>	Special identification algorithms	X				
	Data analytics	X				
	Surveillance cameras	X				
	Wireless communications	X				
	Drones	X				
	Internet of Things	X				
	Augmented reality	X				
	Closed circuit networks (CCTV) in public buildings	X				
	Facial recognition systems	X				
<b>Service 05.01.09: Systems to report and follow up on incidents</b>	Special identification algorithms	X				
	Mobile apps	X				
	Call Centers	X				
	Drones	X				
	Information on the response to incidents (transparency)	X				
	Mobile networks	X				

		Service type		Resilience		
Service	Technology	Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Logical systems (Cybersecurity)	X				

## Sub-dimension 2: Resilience of the city

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 05.02.01:</b> Availability of information for prevention and during a natural disaster	Real-time data analytics	X			X	
	Mobile apps		X	X	X	
	Predictive analytics tools	X		X	X	
	Platforms	X		X	X	
	Data storage systems	X		X	X	
	Data management systems	X		X	X	
	Specialized software	X		X	X	
<b>Service 05.02.02:</b> Management of the response capacity of infrastructures to attend affected	Specialized software		X	X	X	X
	Data management systems		X	X	X	X

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Data storage systems		X	X	X	X
	Real-time data analytics		X		X	X
	Platforms		X	X	X	X
	Mobile apps		X		X	X
	Predictive analytics tools		X	X		X
Service 05.02.03: Mapping critical infrastructure and developing risk atlases	Real-time data analytics	X			X	
	Mobile apps	X		X	X	
	Predictive analytics tools	X		X	X	
	Platforms	X		X	X	
	Data storage systems	X		X	X	

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Data management systems	X		X	X	
	Specialized software	X		X	X	
<b>Service 05.02.04: Model of rescue and evacuation of citizens</b>	Real-time data analytics		X		X	
	Mobile apps		X	X	X	
	Predictive analytics tools		X	X	X	
	Platforms		X	X	X	
	Data storage systems		X	X	X	
	Data management systems		X	X	X	
	Specialized software		X	X	X	
<b>Service 05.02.05: Normal services</b>	Real-time data analytics	X			X	X
	Incident Management Center connected	X			X	X
	Dashboards with KPIs for the assessment of the restoration of normality	X				X



Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
	Development of municipal emergency plans	X		X		X
	Platforms	X				X
	Data storage systems	X				X
	Data management systems	X				X
<b>Service 05.02.06: Early warning systems</b>	Real-time data analytics	X			X	
	Mobile apps	X		X	X	
	Predictive analytics tools	X		X	X	
	Platforms	X		X	X	
	Data storage systems	X		X	X	
	Data management systems	X		X	X	
	Specialized software	X		X	X	

## Education.

### Sub-dimension 1: Talent

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 06.01.01: Talent acquisition and retention</b>	Mobile applications for talent acquisition (e.g. social networks, etc.)		X			
	Portals with information about existing training programs in the city		X			
	Predictive tools to help predict and prepare professionals for their career development		X			
<b>Service 06.01.02: Adaptive training and education</b>	Mobile applications with personalized educational systems (e.g. Duolingo)		X			
	Blended learning (specialized programs with face-to-face and online content)		X			
	Digitized / interactive face-to-face programs		X			
	Augmented reality system (availability of new forms of visualization adapted to the user)		X			
<b>Service 06.01.03: Combating illiteracy</b>	Advanced analytics for the detection and monitoring of cases of illiteracy	X				
	Screens with accessible information	X				
	Education platform	X				
<b>Service 06.01.04: Study aids</b>	Virtual library		X			
	ERP for aid management		X			
	Training platform (educational resources, time bank, etc.)		X			

## Sub-dimension 2: Educational infrastructure

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 06.02.01: Technological endowment in municipal libraries</b>	Online consultation catalogues	X				
	CRM for library card management	X				
	ERP for asset management in libraries	X				
	PCs in libraries	X				
	Platform/web with information about municipal libraries	X				
	Subscriptions to journals, scientific journals and databases	X				
<b>Service 06.02.02: Technological endowment in municipal schools and institutes</b>	Access/subscription to journals, scientific journals and databases	X				
	ERP for asset management in schools	X				
	PCs in schools	X				
	Training platform (educational resources, time bank, etc.)	X				
<b>Service 06.02.03: Continuity of the</b>	Access to digital materials	X		X	X	X

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
educational service	Applications for online classes (classrooms)	X			X	X
	Portable electronic devices (laptops, tablets, etc.)	X		X	X	
Service 06.02.04: Virtual learning systems	Blended learning (specialized programs with face-to-face and online content)		X			
	eLearning Platforms		X			
	Augmented and virtual reality		X			
	TAC (Learning and Knowledge Technologies) in classrooms		X			

### Sub-dimension 3: Digital divide

Service	Technology	Service type		Resilience		
		Smart City Services	Citizen interaction services	Preparation	Response	Recovery
<b>Service 06.03.01:</b> <b>Aid for access to technological infrastructures</b>	ERP for the management of aid and subsidies linked to technological infrastructures		X			
	Portal with information about aids		X			
	Loans of technological devices (PCs, tablets, smartphones, etc.)		X			
<b>Service 06.03.02:</b> <b>ICT skills for employment</b>	Course alerts/subscriptions		X			
	eLearning Courses		X			
	Information platform		X			
	Platform/app of job offers		X			

## Annex 3 - Questionnaire

Below are the questions included in the questionnaire to carry out the evaluation of the smart maturity degree of the city.

### Infrastructure.

#### Physical infrastructure

**Question 1:** Assess the degree of coverage and quality in the city of the following infrastructures:

Infrastructure	Coverage	Penetration	Accessibility
<b><u>Servers</u></b>			
Own data center			
Remote Server			
<b><u>Wired connection</u></b>			
Copper			
Optical fiber			
<b><u>Wireless connection</u></b>			
3G			
4G			
<b><u>Last mile connection</u></b>			
Wi-Fi access points			
<b><u>International connection (if applies)</u></b>			
Submarine cables			

### Options

#### Coverage / Penetration

- ☒ 0-20%
- ☒ 21-40%
- ☒ 41-60%
- ☒ 61-80%
- ☒ 81-100%

#### Accessibility

- ☒ Easy access
- ☒ Normal access
- ☒ Difficulty accessing

#### Digital infrastructures

**Question 1:** Please indicate whether the following statements about available digital infrastructures are true or false:

	Data bases	Data analytics systems	Cloud systems	Integrated management platforms
1	This type of infrastructure is used to respond to the challenges of the dimension			
2	The infrastructure has an adequate volume of data to maximize its use			
3	Policies have been established for the use of the data contained in these infrastructures			
4	The infrastructure has autonomy to capture and integrate data			

### Options

- ☒ True
- ☒ FALSE

**Question 1:** Please indicate whether the following statements about available digital infrastructures are true or false:

	Data bases	Data analytics systems	Cloud systems	Integrated management platforms
5	The data generated is available in an accessible way (format and understanding)			
6	There is a relational database management system (RDBMS) that ensures data redundancy			
7	The digital infrastructure in question has been put in place for the management of services related to the dimensions			
8	Specific security systems are in place to protect the information contained in the infrastructure			

Options

- ☒ True
- ☒ FALSE

Data potential

**Question 1:** Please indicate whether the following statements about data potential are true or false:

<b>How is the generation, collection and analysis of data handled?</b>
Centrally
By dependence
Both of them
<b>What data is generated and collected?</b>
<b>What analysis is done with this data?</b>

Options

- ☒ CENTRALLY
- ☒ BY DEPENDENCE
- ☒ BOT OF THEM

## Capabilities.

### Vision and strategy

1.- Select the option that best defines the city strategy in this dimension:

1	2	3	4	5
There is no strategic planning	There is a strategic plan for the dimension, but the use of technology is not contemplated	Specific projects are developed in the dimension with the application of technology	Technology is commonly used in the development of projects in the dimension	The Dimension is part of a smart plan at the city level

2.- Identify the unit responsible for executing strategic planning in the dimension, regardless of whether it is developing Smart projects:

3.- Is there any incorporation of the concept of resilience into strategic city planning?

### Ecosystem

1.- Indicate which other agents you identify are developing related technological projects in the dimension and indicate if you have collaborated with them:

Type of agent	Do you identify that they are developing projects?	Have you collaborated with them?	Indicate the type of collaboration from 1 to 5	If yes, describe collaboration
Other levels of government (state and national)	Yes/No	Yes/No		
Other municipal areas	Yes/No	Yes/No		
Big companies	Yes/No	Yes/No		
SMEs	Yes/No	Yes/No		
Start-ups	Yes/No	Yes/No		
Educational institutions	Yes/No	Yes/No		
Innovation centers	Yes/No	Yes/No		
Accelerators and innovative initiatives	Yes/No	Yes/No		
Civil associations	Yes/No	Yes/No		
Non-profit entities (NGS, foundations)	Yes/No	Yes/No		

1. Generation of ideas; 2. Conceptualization of projects; 3. Collaboration in designs; 4. Prototyping; 5. Implementation and development of projects



## Financing

1.- Does the dependency budget include specific items or items that may be used for projects with technological components?

Yes ☐ No ☐

2.- Are there tax incentives for the development of Smart projects?

Yes ☐ No ☐

3.- Are there non-refundable funds to the development of Smart projects?

Yes ☐ No ☐

4.- With the financing sources currently available, are the financing needs for Smart projects in the city covered?

Yes ☐ No ☐

Type of financing	Do you identify the existence of funding for technological projects?	Do you have access to some of the identified funding?	What is the percentage of contribution from the funding to the projects?	In case you have used the funding, describe how it was used (quantity, description, availability, etc.)
Development Banks	Yes/No	Yes/No	1 to 5	
Grants	Yes/No	Yes/No	1 to 5	
Commercial banks	Yes/No	Yes/No	1 to 5	
Debt	Yes/No	Yes/No	1 to 5	
Sponsorships	Yes/No	Yes/No	1 to 5	
Multilateral financing	Yes/No	Yes/No	1 to 5	
Public-Private partnerships	Yes/No	Yes/No	1 to 5	
Other (Specify which ones)	Yes/No	Yes/No	1 to 5	

## Coordination

1.- Is there an area responsible for coordinating and promoting Smart initiatives in the unit?

Yes ☐ No ☐

2.- Assess the effectiveness of coordination mechanisms with other units to carry out Smart projects

☐ Good ☐ Medium ☐ Low ☐ Very low ☐

3.- Explain briefly (2-3 lines) how this coordination is articulated (meetings, stable committees, existence of a coordinating body, others).

4.- Assess the effectiveness in exchanging relevant information with other departments

13

☐ Good ☐ Medium ☐ Low ☐ Very low ☐

5.a- Is there a coordination mechanism at the State and/or regional level?

Yes ☐ No ☐

5.b- If yes, indicate how that coordination mechanism is used (timely agreement, framework agreement, programme, etc.)

5.c- If yes, write some experience in this regard

6.a- Is there a coordination mechanism with the business field?

Yes ☐ No ☐ DWrites

6.b- Is there a coordination mechanism with the academic field?

Yes ☐ No ☐ DWrites

7.a.- Is there some specific indicator defined for tracking Smart projects?

Yes ☐ No ☐ Describes

7.b.- If so, how often are they collected?

## Institutional capacities

### 1.- Evaluate staff skills to develop and implement technological projects.

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

### 2.-Explain how staff capabilities contribute to the development and implementation of technological projects

### 3.-Evaluate the quality of the tools available to develop and implement technological projects.

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

### 4.-Explain how the available tools contribute to the development and implementation of technological projects

### 5.- Assess staff capabilities to facilitate access to technological projects financing

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

### 6.-Explain how staff capabilities help facilitate access to technological projects financing

### 7.-Assess the quality of the tools available to facilitate access to financing for technological projects

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

### 8.- Explain how the available tools help facilitate access to financing for technological projects

### 9.- Does the City Hall support the implementation of technological projects in this dimension?

Totally agree ☐ Agree ☐ neutral ☐ Disagree ☐ Totally disagree ☐

### 10.- Evaluate the availability of technological tools for planning this service

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

### 11.- Explain what kind of technological tools you have for planning this service

### 12.- Evaluate staff's capabilities to conduct and evaluate public-private partnerships to implement Smart projects

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

13.- Explain how staff skills contribute to the realization and evaluation of public-private partnerships to implement Smart projects

14.- Have technological projects been developed in collaboration with another city? If yes, explain which

## Legal framework

1.- Do you know the applicable legal framework for the development of technological projects?

Yes ☐ No ☐

2.- Is there a commitment or goal to be fulfilled on the basis of any state or national law that influences the development of technological projects?

Yes ☐ No ☐

3.- Evaluate the existing legal framework in the context of the development of technological projects in this dimension:

- ☐ 1. It is an obstacle and its modification is virtually impossible (e.g. is a state or national competence).
- ☐ 2. It is an obstacle but could be modified to suit the reality of the projects.
- ☐ 3. Does not affect.
- ☐ 4. It is suitable for the needs of the projects.
- ☐ 5. It encourages the development of such projects (e.g. through the implementation of national programs).

4.- Assess the flexibility to adapt the legal framework in a way that facilitates the development of Smart projects

Very high ☐ High ☐ Medium ☐ Low ☐ Null ☐

5.- Assess the extent to which the legal framework facilitates or hinders the acquisition of innovative technology

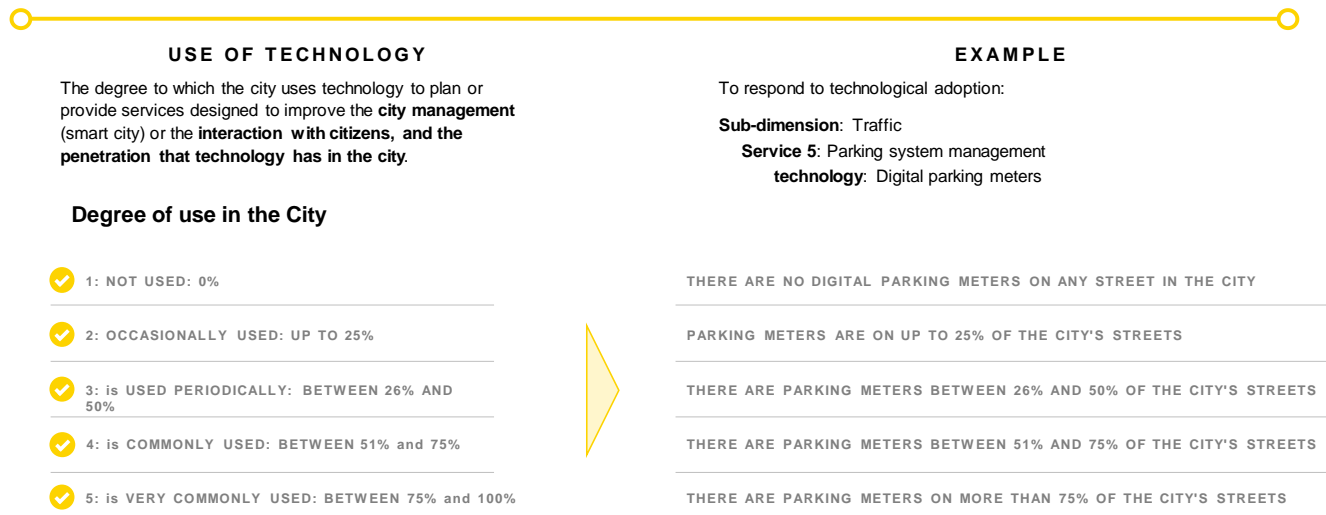
- ☐ 1. The legal framework does not allow the acquisition of innovative technology.
- ☐ 2. The legal framework is not prone to the acquisition of innovative technology.
- ☐ 3. Does not affect.
- ☐ 4. The legal framework facilitates the acquisition of innovative technology.
- ☐ 5. The legal framework is a real stimulus for the acquisition of innovative technology.

6.- Do you identify any applicable legislation for City Resilience or continuity of public services?

Yes ☐ No ☐

## Technological adoption.

For each service, it must be responded to according to the following schema:



	Degree of use	brief description	Location in Ciudad
<b>Service 1:</b>			
<b>Management of semaphorization</b>			
• Controlled semaphorization for vehicles and pedestrians	• 1 – 5	• ...	• ...
• Traffic Control Center	• 1 – 5	• ...	• ...
• Intelligent Semaphorization (RFID)	• 1 – 5	• ...	• ...
• Smart traffic light controlled by artificial intelligence in real time	• 1 – 5	• ...	• ...
• Surveillance cameras	• 1 – 5	• ...	• ...
<b>Service 2:</b>			
<b>Safety for pedestrians and cyclists</b>			
• Digital vehicle detection infrastructure for safe crossings	• 1 – 5	• ...	• ...
• Surveillance cameras at junctions Pedestrian	• 1 – 5	• ...	• ...
• Systems for measurement of pedestrian traffic density	• 1 – 5	• ...	• ...
• Application of location and mapping of safe cycling routes	• 1 – 5	• ...	• ...
• Surveillance cameras	• 1 – 5	• ...	• ...
<b>Service 3:</b>			
<b>Dynamic traffic signals</b>			
• Application for the notification of incidents related to accidents on the road network	• 1 – 5	• ...	• ...
• Surveillance cameras	• 1 – 5	• ...	• ...
• Preventive speed information panels in accident risk areas	• 1 – 5	• ...	• ...
• Speed control panels	• 1 – 5	• ...	• ...
• Electronic signaling with variable messages	• 1 – 5	• ...	• ...
• Traditional signalling on the road network	• 1 – 5	• ...	• ...

Resilience.

Although the resilience of the city is calculated automatically through the tool based on the intensity of use given to the technologies used in each of the services according to the categorization given, the following scheme of questions is proposed as a framework for prior reflection for the people responsible for the maturity assessment. , in order to facilitate the understanding of the use given to technology to prevent, react and recover from any unforeseen and ensotial exogenous circumstances:



RESILIENCE

To what extent are technologies used to increase the resilience of the city during:



PREPARATION

Degree of use in the city

- ✓ 1: NOT USED
- ✓ 2: IT IS OCCASIONALLY USED
- ✓ 3: IT IS USED PERIODICALLY
- ✓ 4: IT IS FREQUENTLY USED
- ✓ 5: IT IS USED VERY FREQUENTLY



ANSWER

Degree of use in the city

- ✓ 1: NOT USED
- ✓ 2: IT IS OCCASIONALLY USED
- ✓ 3: IT IS USED PERIODICALLY
- ✓ 4: IT IS FREQUENTLY USED
- ✓ 5: is USED VERY FREQUENTLY



RECOVERY

Degree of use in the city

- ✓ 1: NOT USED
- ✓ 2: is used occasionally
- ✓ 3: IT IS USED PERIODICALLY
- ✓ 4: IT IS FREQUENTLY USED
- ✓ 5: IT IS USED VERY FREQUENTLY

## Contact

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