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### **SMART CITY PROJECT ASSESSMENT MODELS: IDENTIFICATION AND INTEGRATION OF URBAN STAKEHOLDERS.**

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The global challenges that cities must face in terms of sustainability, efficiency, integration and resilience have found in the Smart City concept a guideline of action as a model for urban development and transformation. The Smart City concept and the assessment models based on it have evolved from a conception focused on the use of technology, to the one that is now generally accepted: holistic, focused on the citizen as demand, using the technologies of information and communication more as a means or catalyst in the transformation process than as a final goal in itself. The most recent models give essential relevance to the alignment between the challenges that cities must face and the projects and initiatives which are implemented within a general urban strategy, considering the urban stakeholders and involving them from the very beginning in the strategy and development of initiatives. This paper establishes the general guidelines for the identification of these urban stakeholders and their integration into assessment models of Smart City projects and initiatives.

Keywords: Urban stakeholders; smart cities; assessment models.

### **MODELOS DE EVALUACIÓN DE PROYECTOS SMART CITY: IDENTIFICACIÓN E INTEGRACIÓN DE ACTORES URBANOS.**

Los retos globales a los que las ciudades deben hacer frente en lo que se refiere a sostenibilidad, eficiencia, integración y resiliencia han encontrado en el concepto Smart City una línea de actuación como modelo de desarrollo y transformación urbana. El concepto Smart City y los modelos de evaluación basados en él, han evolucionado desde una concepción focalizada en el uso de la tecnología, a la que en la actualidad se considera generalmente aceptada: holística, centrada en el ciudadano como demanda, utilizando las tecnologías de la información y la comunicación más como un medio o catalizador del proceso de transformación que como un fin en sí mismo. Los modelos más recientes otorgan una relevancia esencial a la alineación entre los desafíos que las ciudades deben de afrontar y los proyectos e iniciativas que se ponen en marcha dentro de una estrategia urbana general, considerando de forma especial e involucrando en la estrategia y el desarrollo de iniciativas a los diferentes actores urbanos. En este trabajo se establecen las directrices generales en la identificación de estos actores urbanos y su integración en modelos de evaluación de proyectos e iniciativas Smart City.

Palabras claves: Agentes urbanos; smart cities; modelos de evaluación.

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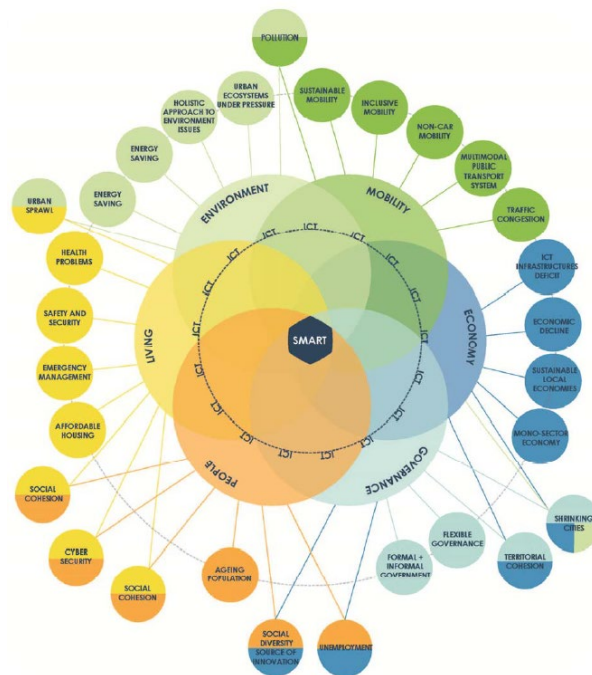
## 1. Introduction

The smart city concept is now widely accepted as a tool for urban transformation to address the global challenges of sustainability, quality of life and efficiency. This model has undergone an evolution over the last few years, from the initial conception mainly based on the use of technology to a holistic concept, focused on urban demand (citizen) considering the different dimensions of the city (Fernández Añez, Fernández-Güell, Giffinger, 2017).

In recent years there has been a great proliferation of assessment models based on the Smart City concept, covering different areas and with different scopes and evaluation philosophies: quantitative, qualitative, based on systems theory, oriented to the development of rankings, and oriented to the evaluation of specific smart city projects and initiatives (Monzón A., 2015).

Since the work of Giffinger et al. in 2007, "Ranking of European Medium-sized Cities," in which a qualitative model of evaluation of medium-sized European cities is set to perform a ranking of them (Giffinger, Fertner, Kramar, Meihers, 2007 and Technische Universität Wien, 2013, 2014 and 2015), the six dimensions of the smart city are established, which in the vast majority of subsequent conceptual models are generally accepted by the scientific community as the basis for holistic Smart Cities models. These are Economy, Human Capital, Governance, Mobility, Environment and Quality of Life, and are also adopted by the European Commission in the report "Mapping Smart Cities in the E.U." as the basis for holistic city dimensioning (Manville, Cochrane, Cave, Miliard, Pedreson, Thaarup, Liebe, Wissner, Massik, Kotterink, 2014).

**Figure 1. ASCIMER model, including challenges by dimensions of the city.**



Source: ASCIMER project, 2015

The most recent models, based on the six dimensions mentioned and the conception of the citizen at the core of the model, incorporate the challenges that cities have to face, such as the case of the ASCIMER model (figure 1) for cities in the Mediterranean area (The Transport Research Center UPM, 2017 and Fernández Añez, Velazquez, Pérez Prada, Monzón, 2018) and at the last level includes, within the model itself and forming an intrinsic part of it, the stakeholders related to the city (Fernández Añez, 2019).

However, the incorporation of urban stakeholders, either within the model or considering them as a fundamental part in the strategic planning process and in the deployment of urban transformation, is deemed to be accurate by multiple authors and included in models and studies on smart cities, although the methods of identification, classification, and the degree of involvement of urban stakeholders within strategic plans or conceptual models of evaluation, differ from one study to another (Fernández Güell, Collado Lara, Guzmán Araña, 2016, Castelnovo, Misuraca, Savoldelli, 2015).

## **2. Objectives**

This paper analyses the different theories and methods for identifying the key urban stakeholders to be taken into account in the conceptual modeling processes of smart cities and their integration into assessment models for Smart City projects and initiatives.

## **3. Methodology**

For this study, a systematic literature review has been carried. The sources chosen has been the following scientific databases:

- Web of Science, <https://apps.webofknowledge.com/>
- Scopus, <https://www.scopus.com/>

All types of documents have been included: journals, conference proceedings, books, and reports. Results have been analyzed in the field of conceptual models, both qualitative and quantitative, of performance assessment or evaluation of smart city initiatives. The first part of the analysis consisted of identifying the definitions of urban stakeholders, and the theoretical basis for their description and classification

The second line identifies their introduction and influence in urban models, whether explicit or implicit in the model, and how their involvement in the transformation processes is considered.

It also analyses the management of the relationships and involvement of the different agents, their interests and objectives, and their degree of participation in the process. Finally, the identification of stakeholders in the smart city action plan of the municipality of Alcoi is analyzed as a case study.

A total of 36 articles and research papers related to models and development of smart city strategies and initiatives have been analyzed. The papers are classified by type of model, and the methodology used for stakeholder identification is analyzed.

## **4. Stakeholders: identification and involvement in the process of urban transformation under the model of Smart cities.**

The most common definition of "stakeholder" is an interested party. Stakeholders are any group or individual who can affect or is affected by the achievement of an organization's objectives (Freeman, Edward, 1984). In the case of the transformation

processes of an urban environment, the very definition of stakeholders leads us to an enormous range of possible urban agents to be taken into account in modeling of the city, especially if the holistic conception of the smart city itself is established as a starting point.

Identification processes are therefore complex, and in practice, tend to be somehow iterative processes, in which additional stakeholders are added as the process itself develops (Reed, Graves, Dandy, Póstumo, Hubacek, Morris, Prella, Quienn, Stringerb et al., 2009).

In any case, the processes of strategic urban planning and city modeling have sufficiently complex and different characteristics from those taken into account in business theories so that their identification processes are also different.

It is quite common to understand the city as an "organic whole," a network with numerous interconnected links (Nam and Pardo, 2011), or from a more technical point of view, as an organic system with multiple interconnected subsystems (Chourabi, Nam, Walker, Gil Garcia, Mellouli, Nahon, Pardo, Hans, 2012). The need for the understanding of local factors, the self-identity of the urban community (Neirotti, De Marco, Cagliano, Mangano, Scorrano, 2013) is related to the integration of urban actors in the transformation processes.

In any case, the essential character of the involvement, collaboration, and commitment in decision making of the agents involved in the urban environment, especially in the aspect of a new model of smart governance (Ruhlandt, 2018) and as a critical part of the transformation towards a smart city (Nam and Pardo, 2011) is widely spread in the scientific literature.

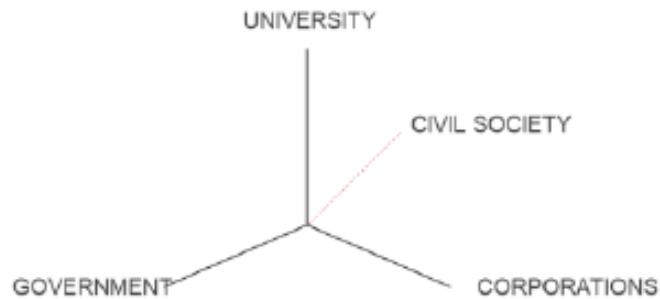
In fact, Manville's aforementioned work for the European Commission, "Mapping Smart Cities in the European Union," incorporates the term stakeholder in the definition of Smart City, conceiving this as a multi-stakeholder municipality-based partnership (Manville Cochrane, Cave, Miliard, Pedreson, Thaarup, Liebe, Wissner, Massik, Kotterink, 2014).

The holistic approach required in the transformation under the smart city model can only be obtained by connecting the different agents involved in the urban environment and including all possible points of view in the planning processes, in which policymakers, ultimately governance, have a fundamental role and is a necessary premise to achieve citizen involvement.

#### **4.1. Triple helix models and extended triple helix.**

The triple helix model (Figure 2) uses the relationship between government-university and business as a mechanism for generating knowledge and innovation. In the work of Leydesdorff and Deakin, the creation of value related to innovation in an urban environment is studied on the basis of this model. It points out the need for strong leadership from the city in order to favor collaboration between the different urban agents. Cultural development is not spontaneous but a result of local government policies, the leadership of academic communities, and business strategies, which must be articulated and built upon in order to create an environment of urban regeneration (Leydesdorff and Deakin, 2010).

**Figure 2. Extended triple helix model.**



**Source: Lombardi et al., 2011**

The triple helix model, with the three agents involved, is conducive to the study of knowledge-based innovation systems, and in the work of Lombardi et al., it is completed with the introduction of a fourth line, the urban market, i.e., the urban demand, since the three actors of the triple helix create knowledge and innovation, but its use depends on the potential local market. A strong social and intellectual base is necessary (Lombardi et al., 2011). Therefore it is necessary to add a fourth line to the urban actors.

#### **4.2. Stakeholders as the core of the Smart City model**

The importance of the relationships of urban stakeholders in the urban sphere and their involvement in decision-making processes and even in governance reaches the point of being taken as a dimension of its own. Castelnovo (2015) sets the involvement of stakeholders and the strength of relationships between them. This dimension of the city is placed at the centre of the model, which develops its relationships with the formulation of strategies, the management of resources and knowledge, the generation of public value, and financial-economic sustainability. The model considers the participation of the main urban stakeholders and citizens in strategic planning processes to be essential.

The direct participation of key urban stakeholders is considered a fundamental step, which is developed throughout the process, within the methodology of modeling the urban environment and strategic planning of envisioned scenarios (Figure 3, Fernández-Güell, Collado Lara, Guzmán Araña, 2016). bringing together technologists, urban planners, and key urban stakeholders to reflect the very diversity of the city. It also places the main urban stakeholders at its center, as part of the urban demand that is composed of citizens, economic agents, social institutions, and tourism.

**Figure 3. Stakeholders at the center of the model.**



**Source: Fernández-Güell, Collado Lara, Guzmán Araña, Fernández Añez, 2016**

The participation of the main urban stakeholders in the whole process is considered critical for the success of the process, and in fact, a survey is conducted with a series of interviews on attitudes towards the proposed model. The involved parties taken into account in this process are (Fernández-Güell, Collado Lara, Guzmán Araña, Fernández Añez 2016):

- City councils.
- Municipal departments in charge of smart city initiatives.
- Urban services managers.
- Autonomous administration in the field of transport.
- State administration in charge of urban policies.
- University research centers related to smart cities.
- Telecommunication operators.
- Municipal waste managers.
- Consultants related to telecommunications infrastructure in smart cities.
- Internet service companies related to smart cities.

The identified stakeholders can be subscribed within the categories established by the extended triple helix (Lombardi et al., 2011), covering three of the four, with social agents remaining unrepresented in this case.

More modern models, with the evolution of giving increasing importance to governance, a centric conception of citizenship, and a key role assigned to urban stakeholders, consider these within the model itself. Fernández Añez (2019) identifies urban main stakeholders following the modified triple helix model (Figure 4):

- Knowledge stakeholders.
- Social stakeholders.
- Economic stakeholders.
- Political stakeholders.

**Figure 4. Stakeholders in Fernández Añez's model.**



**Source: Fernández Añez, 2019**

In the implementation of the model in the cities of Vienna, Milan, and Barcelona, the selection method consisted in covering all groups of stakeholders involved, related to the six dimensions of the city and to the transversal subsystems of planning and technology (at least one representative in each dimension and subsystem). In other words, a representative sample of stakeholders is considered to be involved when they cover the four groups considered and the dimensions of economy, mobility, environment, governance, quality of life and intellectual capital, and the planning and technology subsystems.

#### **4.3. Identifications of stakeholders in other models**

As the smart city is considered as an innovation environment that requires the participation of multiple stakeholders and arouses the interest of the business world, they are considered as follows (Moreno Alonso, 2016):

- Local administration, politicians, and city managers.
- Citizens and local businesses.
- Public and private municipal service providers.
- Investors: private banking, venture capital, funds, etc.
- Providers of technological and financial solutions.

In this case, the unrepresented part of the extended triple helix model is the one referring to knowledge agents.

Jayasena, Mallawaarachchi, and Waidayasekara's research are focused on the identification of stakeholders in the field of smart cities. The following ones are described:

- Knowledge and research institutions.
- Local and regional administrations.
- Investors and financial institutions.
- Energy supply companies.
- Representatives of the telecommunications sector.
- Citizens.
- Government.
- Real estate developers.
- Non-profit organizations.
- Urban planners.
- Politicians.
- Experts and scientists.
- Political institutions.
- Media.

In this case, the four types of agents involved are covered. This classification is more detailed (as it is a study focused on identification), but it is even redundant, especially in the case of political agents, and very specific in the area of business.

#### **4.4. Management, interest, and contributions of stakeholders.**

The management of the stakeholders involved in the process is considered a fundamental activity to achieve the success of urban transformation processes (Jayasena, 2019). It is a matter of identifying the planning and development phases of projects, initiatives, and strategies where each stakeholder involved should intervene more directly.

The involvement of citizens in all stages, especially in those projects based on innovation, is considered fundamental by several authors (Lombardi et al., 2011, Neirrotti, De Marco, Cagliano, Mangano, Scorrano, 2014). The involvement of the largest number of stakeholders in strategic planning processes is also widespread (Fernández-Güell, Collado Lara, Guzmán Araña, 2016, Castelnovo, Misuraca, Savoldelli, 2015). However, achieving an optimal degree of involvement is a task where local governments must have maximum responsibility, and the achievement of this involvement is related to the interests of the different stakeholders.

A correct selection of urban stakeholders must take into account heterogeneity and representativeness in terms of sectoral origin, targets, and interests. It is important to ensure that the activities of the different stakeholders are aligned with the fundamental objectives of the intended smart city plans and projects (Jayasena et al., 2019). Apart from the obvious ethical implications and possible conflicts of interest with the community good, an excessive presence of a particular sector, for example, technology companies, can pervert the debate and move it away from planning with a holistic character, focusing strategies and initiatives to a specific line.

In a research of the interests of stakeholders in the urban environment based on the definitions of smart city provided by each entity, considering political, knowledge and economic stakeholders (excluding social ones due to the lack of available definitions of the smart city) (Fernández Añez, Fernández-Güell, Giffinger 2016), the aspects related to human capital are revealed as the main interest for knowledge stakeholders, while governance and environment are so for political ones at regional and state level and



governance and human capital at the local level, and governance, economy, and environment for economic stakeholders.

Knowledge agents reveal the quality of life as the main objective to be achieved. Sustainability is the objective for political stakeholders at a regional and national level, and efficiency, sustainability, and quality of life at a local level and economic stakeholders (Fernández Añez, Fernández-Güell, Giffinger , 2016).

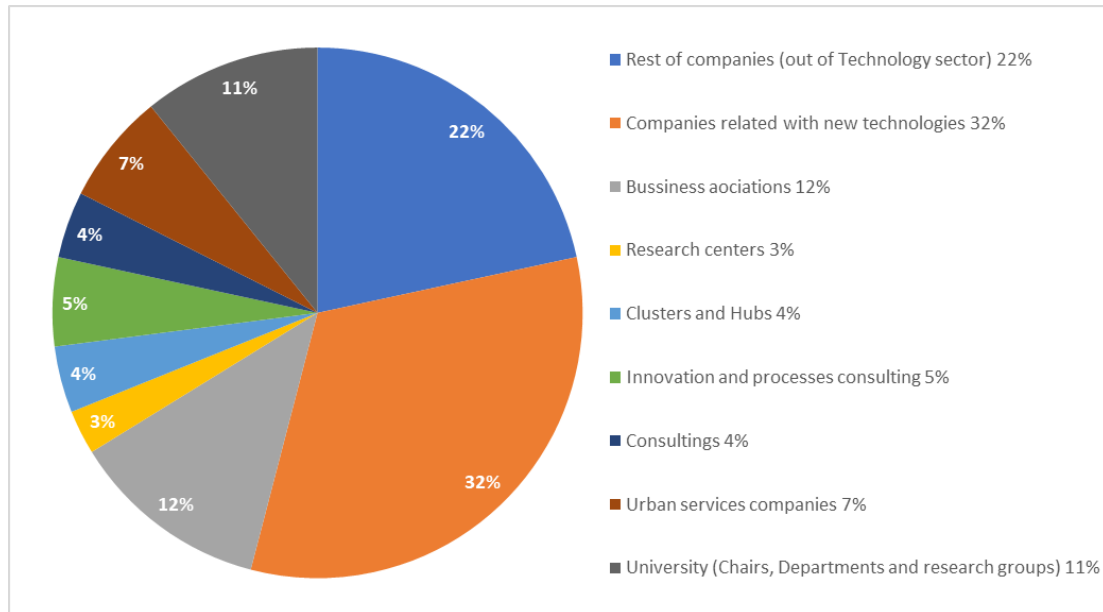
Regarding the expected contributions in theoretical studies of each group of stakeholders involved, Jayasena, Mallawaarachchi, Waidyasekara, (2019) highlights:

- Knowledge agents: Fundamental contribution in planning and strategy development processes.
- Local and regional administrations: Management of administrative, technical, and economic-financial resources.
- Investors and financial entities: Financial resources.
- Energy supply companies: Support in development with a focus on sustainability.
- Representatives of the telecommunications sector: Operational aspects of project and initiative deployment.
- Citizens: Main agents involved in all areas and the most important phases of the processes possible.
- Government: Starting point of the transformation process.
- Real estate developers: Detection of conflicts of interest.
- Non-profit organizations: Monitoring and results of projects and initiatives.
- Urban planners: Planning and strategy development.
- Politicians: Transparency and governance.
- Experts and scientists: Involvement in the planning process.
- Political institutions: Governance
- Media: Impact of projects and initiatives, monitoring and results of projects and initiatives.

## **5. Case study: City of Alcoy**

As a case study of a selection process, the smart city plan of the city of Alcoy (Valencian Community, Spain) is analyzed. The data have been obtained from the database of the Smart cities department of the Alcoy City Council, maintaining the anonymity of the public and private entities involved. Figure 5 describes the distribution of stakeholders that have been considered by the city government for its plan. They focus on the knowledge and economic spheres since the political and social spheres are interpreted transversally in the plans according to their own definition.

**Figure 5. Stakeholders in Alcoi (Typologies).**



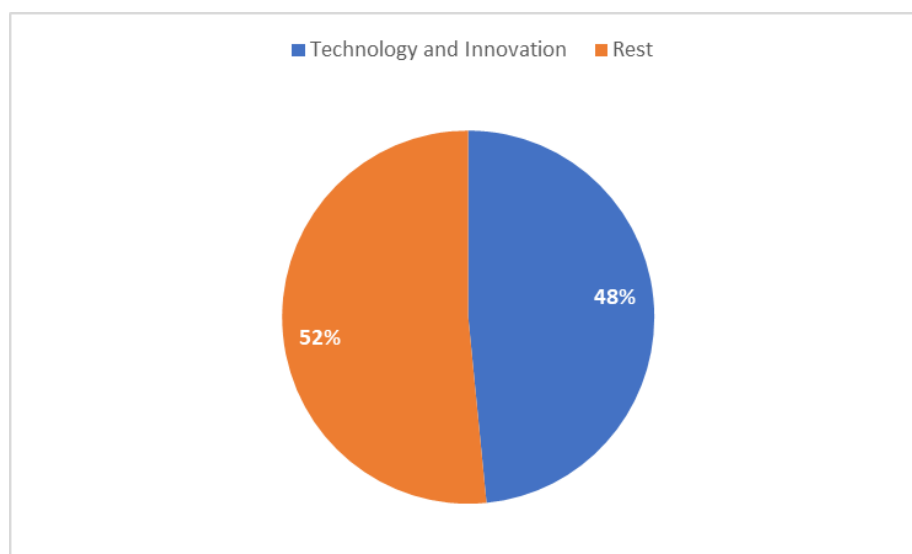
**Source: Own elaboration.**

The first classification by typology shows a fairly high degree of heterogeneity (Figure 5). In the field of knowledge, university chairs and departments, as well as research centers, are represented, covering practically all existing possibilities, although the percentage could seem low.

In the field of economic stakeholders, a wide variety of sectors have been covered, with the presence of a large number of the most important companies in the urban area, as well as the main business associations, sectorial and multisectorial associations, and urban services companies.

However, the presence of companies related to the technology sector stands out.

**Figure 6. Economic stakeholders in Alcoi.**



**Source: Own elaboration.**

Of the whole representation of the business sector, more than half belong to companies whose exclusive activity is related to technology and innovation (Figure 6). This aspect is not in itself negative, but it can condition the planning and strategy development processes, as a specific sector is overrepresented in relation to the real economic activity of the urban area under study. The indissolubility of the smart city concept with the use of technologies is clear, but always considering these as a means to achieve the ultimate objectives of efficiency, sustainability, and quality of life of citizens and without falling into the risk, even more, accentuated in small cities, of establishing technological barriers and harming the integration of citizens in the process and in the result. In this way, there is a danger of giving too much specific weight to a particular sector that is already highly represented in the processes of transforming smart cities. A lack of representation of SMEs and the self-employed, as a sector with an important and growing weight in the economy, mainly in small cities, is detected.

## 6. Conclusions

The essential nature of the involvement, collaboration, commitment, and participation in decision-making by urban stakeholders in the processes of transformation of urban centers under the smart city model is a widespread idea in the scientific literature related to models of representation of the urban environment since even at the European Commission level the smart city is considered as a multi-stakeholder municipally-based partnership.

In fact, several conceptual models of smart city representation consider these relationships at the very core of the model, either by considering them necessary throughout the processes of strategic planning and deployment of initiatives and projects or by studying their relationships with the processes of strategy formulation, resource and knowledge management, value generation and economic-financial sustainability.

Political representatives, within the scope of governance aligned with the smart city, have a fundamental role in this involvement, favoring collaboration between the different urban stakeholders as a prior and necessary step to involve citizens in the whole process of planning and management of the city model.

The extended triple helix model, considering economic, knowledge, political and social stakeholders, without losing sight of the location of citizens as the core of the model, is a simple classification and identification tool, although it must be completed, in a holistic environment such as the smart city, with an identification of stakeholders covering the dimensions of the Smart City (Economy, Mobility, Environment, Human and Intellectual Capital, Quality of Life and Governance) and the planning and technology subsystems.

A representative heterogeneity of the urban environment must be achieved, considering the interests and targets of each sector, so as not to condition the transformation processes, ensuring that those are aligned with the fundamental objectives of the plans and initiatives.

The identification and management of stakeholders in all the stages of planning and project development, identifying where each stakeholder should intervene more directly, achieving an optimal degree of involvement in each stage, even considering real results and impacts of the initiatives developed, is a very important part of the analysis.

In relation to the case study, it is relevant to highlight that the analysis presented considers the objective contributions of the identification of stakeholders, which has been carried out by the city government. At the socio-political level, given the complexity of managing a city of these dimensions, there could be aspects not evidenced that weigh

the identification process. The conditioning and objectivity of stakeholder identification processes according to the entity or organization that executes it is an aspect of interest to be addressed in future research.

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