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Financing of smart and sustainable city projects

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GC
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ABSTRACT
The availability of financial resources is an indispensable requirement for the execution of any type of project, whether in Brazil or abroad, short or long term, public or private, and regardless of the area of human knowledge. The implementation of smart and sustainable city projects is complex and intersects and is more complicated due to the large financial volumes involved and the scarcity of public budget. Through integrative review of the literature, this article aims to research the issue of financing smart and sustainable city projects in Brazil and abroad, giving an overview of the current situation and emphasizing alternatives for increasing resources and expanding funding sources. The results showed that, even with all the concern and prestige of being elected one of the 17 Sustainable Development Goals by the UN, the implementation of smart and sustainable cities, through projects and actions, however relevant, efficient, modern, necessary, and beneficial to society, if they do not overcome the obstacle of financing, will not extend beyond ideas, with developing countries being the most affected. However, there was a range of initiatives that seek alternative financing, aiming to overcome the scarcity of resources and the need for implementation of such projects, but still require attention and improvement, and the so-called "sustainable financing" as a paradigm shift in investments, with great potential for growth and diversity of possibilities.

KEYWORDS: Smart and sustainable cities. Smart cities. Financing. Projects. Alternative sources. Literature review.

1 INTRODUCTION

Currently, 56.2% of the world population, which is equivalent to 7.8 billion people, live in cities. It is estimated that this number will increase to 68.4% by 2050. In Brazil, the increase estimate will reach 92.4% of the population (UNHABITAT, 2020).

In 2015, the United Nations (UN) elected the implementation of smart and sustainable cities as one of the 17 Sustainable Development Goals - SDGs, after a long process of international discussion in which Brazil played a fundamental role. The action started with the first Conference on Environment and Development (RIO 92), then with the RIO + 20 Conference, until culminating in the 2030 Agenda and updating of the Millennium Development Goals - MDG (UNITED NATIONS ORGANIZATIONS - ORGANIZAÇÃO DAS NAÇÕES UNIDAS, BRAZIL; AGENDA 2030, BRAZIL).

The means to achieve objectives are as important as conceiving a great idea and the goals to be accomplished. Thus, in addition to a good project, there must be an adequate financial structure, with sufficient capital provision. Therefore, financing is a central and decisive issue in the implementation of smart and sustainable city projects.

Historically, in Brazil and abroad, the financing of such projects is assumed by the public sector (OLIVEIRA, 2020), as this is the fastest way to promote these, since there is no single obligation of financial return (CAVALCANTE, 2018). However, in the country, given the crisis in the public sector with increasing indebtedness, increased machine costs, rigid collection, and a shortage of budgetary resources, the lack of financing has become one of the main constraints to the policy of smart cities (ALVES; DIAS; SEIXAS , 2019). Thus, it is a reality to be addressed by managers and administrators, who aim to execute projects that, although important, necessary, and beneficial to society, often do not extend beyond ideas.

GC
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ANAP

2 OBJECTIVES

The main objective of this article is to present a literature review of the works that address the issue of financing smart and sustainable city projects in Brazil and in the world. Thus, it seeks to draw an overview of the various realities encountered, indicate the main constraints and challenges, and emphasize the alternatives for increasing resources and expanding sources of financing.

3 METHOD

For the elaboration of this article, the authors utilized the Integrative Systematic Review method (BOTELHO; CUNHA; MACEDO, 2011), aiming to enable a synthesis of several published studies to generate new knowledge. This is based on the results presented by previous research (MENDES; SILVEIRA; GALVÃO, 2008) and to obtain a deep understanding of the phenomenon based on others' work (BROOME, 2000).

Research was performed on the CAPES, SCOPUS and SCIELO Periodical databases, using the terms, both in Portuguese and in English, "Financing", "Projects", "Smart cities", "Financing Smart cities projects", "Financing Smart cities", and "Financing smart city projects". The research collections were completed in September and October 2020.

The discussion about the concept of smart and sustainable cities or smart cities was not considered, since the implementation of any and all projects that involve it will unavoidably address the question of financing, regardless of its area of operation (technology, engineering, architecture, health, economics, social or environmental sciences).

After analyzing their abstracts, the authors selected articles according to the relevance for this research. According to Table 1, the majority are from developing countries.

Table 1 - Articles analyzed by base and by country

Base	Articles
SCIELO	1
Periódico CAPES	7
SCOPUS	15
País de origem	**Artigos**
Brazil	8
Cuba	1
Spain	1
India	3
Indonesia	1
Italy	2
Mexico	1
Portugal	1
Russia	4
Serbian	1

Source: the authors

GC
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ANAP

4 RESULTS

The majority of the findings (81%) do not specifically address the issue of financing. It approaches the theme incidentally or sporadically and focuses on other relevant aspects, such as social participation, which is the inclusion of citizens in the process of implementing smart city models (MUNIZ, 2020). Other relevant aspects are: the intensive use of Information and Communication Technologies - ICTs (DE FREITAS; VASCONCELOS, 2019); green buildings and sustainable mobility (CASINI, 2017); the lack of standardization of the methodologies and indicators of the projects (ALETÀ; MORENO; ARCE-RUIZ, 2017) and the criteria that define a smart city and the scale of its "maturity" (CUNHA, 2017); the need for greater cooperation between different countries and continents (DI PASQUALE; SANTOS; LEAL; TOZZI, 2016) and constant dialogue between stakeholders - civil society and the private sector (CHANG; KURI, 2014), and the lack of specialists for implementation of projects, including architects, urban planners, engineers, and managers (GUPTA, 2019).

However, when the issue of financing smart and sustainable city projects is discussed, except for reports from developed countries, there is an unfavorable financial situation for such investments in governments. There were project cancellations, such as what happened in Indonesia in 2018, when President Joko Widodo suspended the implementation of 14 important national strategic projects, especially in the area of infrastructure, among them, dams and railway network, whose cost was $20 billion dollars (ATMOJO; KASIH; CHANDRA, 2019). In India, in 2019, there was a need for US $777.73 billion in infrastructure investments for sustainability by the year 2022, but in the 2018/2019 budget, there was only US $63.20 billion allotted for this purpose (SHARMA; SHARMA, 2019).

Conversely, there are numerous initiatives aimed at alternative sources of financing. One example comes from Indonesia, where in 2018 and 2019, the local government issued investment bonds, called Retail Saving Bonds with the intention of leveraging savings and national investment capacity by approximately US $600 million (ATMOJO; KASIH; CHANDRA, 2019). It was found that for such an initiative to be successful, absolute transparency by the government is necessary to win investor confidence. In addition, it is necessary that the population already have an investment culture, requirements that are little developed in Brazil.

In India, as soon Prime Minister Narendra Modi took office in 2014, he set the goal of instituting 100 cities as being smart, including Gwalior. To finance such projects, it was planned to: i) share expenses between states and municipal governments; ii) receive loans from internal and external financial institutions; iii) use resources from the National Investment and Infrastructure Fund; iv) Public-Private Partnerships (PPP) and v) innovative financial mechanisms, including the issuance of municipal bonds, the Pooled Finance Development Fund Scheme, and the Tax Increment Financing (GUPTA, 2019). Another alternative source of funding is crowd funding, or collaborative financing. Commonly used for social projects through digital platforms, it was used for the first time in public infrastructure projects in the city of Rotterdam, in 2011, for the construction of a pedestrian bridge (SHARMA; SHARMA, 2019).

GC
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ANAP

There are also conceptual and theoretical proposals that, according to their authors, can generate revenue for the financing of smart cities. One is a proposal by Indian economist Alok Kumar Mishra. This researcher argues that to be successful in the long term, from the point of view of resources, smart and sustainable city projects to be implemented in developing countries must be self-financed based on the combination of the principles contained in the Henry George Theorem (HGT), known in urban economics, and in the Mohring – Harwitz Theorem (MHT), popular in transport economics. Briefly summarizing, the first emphasizes the taxation of the value of urban land (beneficiaries pay), something that approximates the progressive Brazilian (Property and Urban Land Tax - IPTU), the public lighting rate or the improvement contribution. The second is "congestion" (congestion pays) and takes as an example the environmental fine for polluting agents or surcharges for parking vehicles in high concentration areas in the city of Singapore (MISHRA, 2019).

In Brazil, special public funds, such as those in the Amazon (SALLES; PAIVA; PAULINO, 2017), those of diffuse interests and those of the environment, among others, and public-private partnerships (PPP) (OLIVEIRA; PINHANEZ, 2017) are alternatives used to finance smart and sustainable city projects. However, these funds require an operational capacity that may not exist in the municipalities (ALVES; DIAS; SEIXAS, 2019), as they require technical knowledge from the public manager in the elaboration of complex notices, specific terms of reference, long-term planning that, often goes beyond the mandate of the governor, and monitoring. This inability can prove to be an insurmountable barrier and hinder the project at its inception.

In developed countries, particularly in Europe, a successful strategy is the establishment of international public funds for the launch of smart and sustainable city projects, fueled by resources from great economic powers. Among them, it is possible to mention Horizon 2020 and the Connecting Europe Facility, each with an investment potential of € 6 billion, and the Cohesion Fund with € 23 billion (CASINI, 2017).

The discussion of financing smart and sustainable city projects goes far beyond models, strategies, and alternative solutions for their increase. One of the main challenges to obtain a significant increase in financing, especially in developing countries and, as a result, of implemented projects, is to change the logic of finance and the idea of profit at any cost. Much of the lack in terms of financing and investment is due to the inexorable logic of financial return, so prevalent in this financial environment (CAVALCANTE, 2018). The scarcity of public resources that, due to their nature, do not prioritize financial profits, coupled with the existence of private capital, which are driven exclusively by the return on investment, form a limiting scenario for the financing of smart and sustainable city projects. This is due to the impossibility of monetizing the benefits of certain projects or the delay in their profitability. It is necessary, even if partially, to superimpose the financial return on other indicators of return that are also significant, including social, environmental, and spatial ones.

This paradigm shift, which removes profit as the only guiding principle of financing, requires efforts by governments, not only in the regulatory treatment, but also in the incentive to develop financial innovations (CAVALCANTE, 2018), stakeholders, and the whole of society.

GC
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ANAP

This innovative approach has already started with the so-called sustainable financing, in which financial institutions put social and environmental impact first, when considering investments or loan proposals. However, only a very small fraction of financial institutions already adopt sustainable financing and only a third of financial institutions are in the process of migrating to this new model (SCHOENMAKER; DIRK, 2018). In Brazil, there are already private financial agents, who develop business models for sustainable enterprises like Baanko, in addition to public development banks (CAVALCANTE, 2018).

Despite the small-scale application, sustainable finance has demonstrated that it has the potential to surpass finance as a goal (profit maximization), to facilitate sustainable development (SCHOENMAKER, 2018). Still, with the increase in their possibilities, these finances can promote a true urban transformation, with economic benefits being a side effect of investments (CAVALCANTE, 2018).

Whatever the solution outlined for the issue of financing smart and sustainable city projects, its promotion involves the innovation of financing models and the financial agents themselves, in which the participation of governments is essential. This occurs not only in the regulatory treatment, to promote the activity (CAVALCANTE, 2018), but also to achieve a better fiscal balance, in the formation of a favorable political context, of a central articulator in the dialogue between the different stakeholders (CHANG; KURI , 2014) and, mainly, a financing agent, in partnership with private agents.

5 CONCLUSION

The need to implement smart and sustainable city projects is indisputable, given the prospect of increasing population concentration in urban centers. However, the scarcity of financial resources for such projects is a major obstacle to overcome, especially in the public sector. Such problems are not exclusive to Brazil. As evident in this research, it is a reality that predominantly affects developing countries. However, this situation can be confronted and mitigated, with the adoption of innovative solutions that are appropriate to the reality of each country, seeking the use of alternative sources of financing.

Such alternative sources have become admirable options, if not the only ones, for countries with budgetary problems, in view of the fiscal adjustment scenario that many live in and that generates little margin for investments. There are several examples and ways in which these sources are used, such as the matter of issuing municipal bonds, the use of funds, Public-Private Partnerships (PPP), collaborative financing, in addition to traditional loans from internal and external financial institutions, all with specific requirements and premises to be met.

Many of these presented solutions are premature and require improvement of studies and deeper analysis to be considered models. However, if well designed and regulated, they have the potential to boost investments in smart and sustainable city projects.

In addition to alternative sources, the so-called sustainable financing, resulting from a paradigm shift in investments in which the financial return is no longer the main decisive factor, have a great capacity for growth and breadth. These financings include other factors, such as social and environmental, currently used on a small scale and on a secondary basis, as main and decisive factors.

GC
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In any case, governments continue to play a fundamental role in the search for these resources and they must lead the entire process, whether in building a favorable political and normative context, or in maintaining a constant dialogue between stakeholders - civil society and the private sector, aiming to attract capital (CHANG; KURI, 2014). Thus, the importance of the governmental role in the whole process is reaffirmed, whether in the acquisition of market and population confidence - premises for a successful bond issuance program (CASINI; MARCO, 2017; ATMOJO; KASIH; CHANDRA, 2019), or in the relationship and cooperation with other countries (DI PASQUALE; SANTOS; LEAL; TOZZI, 2016), which is fundamental for the standardization of methodologies and project indicators, since such a measure would contribute to a better evaluation of these (ALETÀ; MORENO; ARCE-RUIZ, 2017), including from the point of view of sustainable financing.

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