

INNOVATION AND SUSTAINABLE DEVELOPMENT OF SMART CITIES: A SYSTEMATIC REVIEW TO IDENTIFY RESEARCH TRENDS AND GAPS

*A inovação e o desenvolvimento sustentável de cidades inteligentes:
uma revisão sistemática para identificação de tendências e lacunas de pesquisas*

Sofia Deodoro dos Santos Camata, Siliane Vanessa Sartori,
Mariana Manente Bettini, Diego de Melo Conti

Postgraduate Program in Sustainability, Center for Economics and Administration,
Pontifical Catholic University of Campinas (PUC-Campinas),
sofiadeodoro@hotmail.com, silisartori@yahoo.com.br, maribettini@hotmail.com,
diegoconti@uol.com.br

ABSTRACT

A smart city presupposes an innovative society that connects technologies to people, contributing to the development of cities. It implies an approach in which knowledge works as a strategic tool to design efficient and sustainable supply of goods and services to the community. Based on systematic literature review, this research's objective was to analyze the role of innovation in the sustainable development of smart cities and discuss the research gaps and trends on the topic. The analyzed documents were evaluated in terms of the number of annual publications, the regional mapping of publications, and areas of interest. A relationship network was drawn up with the keywords established by the authors in order to identify research trends and opportunities. Even though we are dealing with a recent topic, the systematic review showed that there are significant important approaches in the field of sustainability, but still little explored, as in the case of studies focused on smart health and governance of urban centers. On the other hand, studies related to the use of "big data" and sustainable development for cities stand out, indicating a possible trend in the scientific area. The increase of scientific interest in the topic was noticed in the analysis, not only because of the growing number of publications, but also because of the varied new research approaching subjects not yet explored.

Keywords: Innovation. Sustainable Development. Smart Cities. Sustainability.

ACEITO EM: 13/11/2022

PUBLICADO: 30/12/2022

A INOVAÇÃO E O DESENVOLVIMENTO SUSTENTÁVEL DE CIDADES INTELIGENTES: UMA REVISÃO SISTEMÁTICA PARA IDENTIFICAÇÃO DE TENDÊNCIAS E LACUNAS DE PESQUISAS

Innovation and sustainable development of smart cities: a systematic review to identify research trends and gaps

Sofia Deodoro dos Santos Camata, Siliane Vanessa Sartori,
Mariana Manente Bettini, Diego de Melo Conti
Postgraduate Program in Sustainability, Center for Economics and Administration,
Pontifical Catholic University of Campinas (PUC-Campinas),
sofiadeodoro@hotmail.com, silisartori@yahoo.com.br, maribettini@hotmail.com,
diegoconti@uol.com.br

RESUMO

Uma cidade inteligente pressupõe uma sociedade inovadora que conecta tecnologias às pessoas, contribuindo para o desenvolvimento das cidades. Implica uma abordagem em que o conhecimento funciona como uma ferramenta estratégica para projetar o fornecimento eficiente e sustentável de bens e serviços para a comunidade. Com base em revisão sistemática da literatura, o objetivo desta pesquisa foi analisar o papel da inovação no desenvolvimento sustentável de cidades inteligentes e discutir as lacunas e tendências de pesquisa sobre o tema. Os documentos analisados foram avaliados quanto ao número de publicações anuais, mapeamento regional de publicações e áreas de interesse. Uma rede de relacionamento foi elaborada com as palavras-chave estabelecidas pelos autores para identificar tendências e oportunidades de pesquisa. Mesmo tratando-se de um tema recente, a revisão sistemática mostrou que existem abordagens importantes e significativas no campo da sustentabilidade, mas ainda pouco exploradas, como é o caso de estudos voltados para saúde inteligente e governança de centros urbanos. Por outro lado, destacam-se estudos relacionados ao uso de “big data” e desenvolvimento sustentável para cidades, indicando uma possível tendência na área científica. Percebeu-se na análise o aumento do interesse científico pelo tema, não só pelo crescente número de publicações, mas também pela variedade de novas pesquisas abordando assuntos ainda não explorados.

Palavras-chave: Inovação. Desenvolvimento sustentável. Cidades Inteligentes. Sustentabilidade.

INTRODUCTION

Cities are complex, networked, and ever-changing social ecosystems, shaped and transformed through the interaction of different interests and ambitions. Employment, sustainable development, social inclusion, security, and quality of life are important concerns, and, on this matter, many cities face a wide range of challenges (SCHAFFERS; RATTI; KOMNINOS, 2012; KNISS et al., 2019).

In this scenario, the importance of adopting strategies to enable better planning and management of urban spaces is growing (BENTO et al, 2018). Smart and sustainable cities emerge as answers to these challenges by acting as ecosystems that boost collaboration among diverse members and, consequently, the development of innovative ideas (CONTI et al., 2019; APPIO; LIMA; PAROUTIS, 2019). In this context, tools such as Information and Communication Technologies (ICT) appear as an important part of the process (WEISS, 2019).

Innovation is an essential element for cities in the search for greater competitiveness, efficiency, and development. Nevertheless, this factor has overcome the purely economic barrier and reached strategies aimed at sustainable development (SILVEIRA et al., 2016). According to Weiss (2019), the exhaustion of natural resources, accelerated urbanization, and the search for better quality of life are issues that have gained greater prominence recently.

Moreover, given the variety of existing innovative mechanisms, tools to provide smart urban and regional governance are important to develop a society, increase competitive advantage, foster collaboration and knowledge sharing in the pursuit of smart and sustainable cities (CONTI et al., 2019).

Along those lines, according to the World Cities Report 2020 by UN-HABITAT:

At its most optimistic, a smart city might best be defined as an “innovative city that uses information and communication technologies and other means to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects (UN-HABITAT, 2020, p. 192).

Considering the above, smart cities’ importance can be seen in view of the challenges and opportunities arising from the search for a more sustainable world. The following problem question arises: What role does innovation play in the sustainable development of smart cities?

Thus, this article’s objective was to analyze the role of innovation in the sustainable development of smart cities and discuss the research gaps and trends on the topic.

The motives for conducting this study were oriented so that the analysis results proposed here, from the academic perspective, could be part of a collection of recent publications about the role of innovation in the sustainable development of smart cities.

Based on the picture presented and in order to reach this article’s objective, this research is structured in five sections aiming to contribute to the theoretical discussion on innovation and smart cities, correlating the perspectives of sustainable development. Thus, the article is organized as follows: (i) Section one presents the introduction of the study; (ii) Section two deals with literature review, (iii) Section three is about the methodology that guided the research, (iv) Section four presents the results and discussions, and finally, (v) Section five concludes the article, followed by the acknowledgments and references.

1 LITERATURE REVIEW

The system of references that supports the topics addressed in this article is divided into two subtopics. The first links Innovation and its relation to Sustainable Development and the second addresses Innovation and its relation to Smart Cities.

1.1 Innovation and its relation to sustainable development

Over the past decades, various social movements have focused attention on the challenges of globalization and the need to promote sustainable development. These concerns are largely driven by the fixation on economic growth as the main philosophy of development, leading to increased social disparities and economic recession, as well as contributing to the depletion of natural resources and the deterioration of the environment.

Correia *et al.* (2018) state that one of the most important issues of sustainable development is the replacement of the unilateralist development paradigm, which focuses on economic growth, with an endogenous development model, in which the community is immersed in democratic and participatory practices capable of promoting well-being and better living conditions.

In this regard, the Brundtland Report: “Our Common Future” (1991, p. 46) states that sustainable development seeks “to meet the needs and aspirations of the present without compromising the ability to meet those of the future.” Still, according to the Brundtland Report, development implies a progressive transformation of the economy and society (CMMAD, 1991).

According to Koroneos and Rokos (2012), in examining the major environmental problems facing the world and the appropriate responses to them, the Brundtland Report established the framework under which the twin requirements of environmental protection and economic development could be integrated. According to the authors, sustainable development rapidly became the key principle underpinning official environmental policy at both national and international levels (KORONEOS; ROKOS, p. 142, 2012).

Thus, despite the fact that economic growth continues to be one of the most pressing challenges of contemporary societies, there is an urgent need to promote a development model that seeks to add value to the economic dynamics in order to structure development policies capable of providing environmental balance and social justice.

In this sense, innovation for sustainable development emerges as a possibility to seek different ways of acting and modernizing traditional practices, providing a change not only in mentality but also in methods, organizational processes, and even tools, since innovations can occur both in production processes and in the improvement of products or services, aspiring to obtain economic, social, and environmental return.

The term innovation should be understood as a new or improved product, service, or process. Innovative ideas are commonly developed through the interaction of different institutions, such as companies and universities, and may occur thanks to government stimuli (SILVEIRA *et al.*, 2016). Innovation is an interactive process, in which knowledge of different parts, economic and social, contributes to the achievement of the goal. Schumpeter (1988) deems important to distinguish between innovation and invention. Inventions have no economic significance until they are put into practice, whereas innovation presupposes success in its application.

The search for a more sustainable world combined with innovation may represent an opportunity for those who intend to deliver more value to their public. Eco-innovation is an example of this combination. The idea is to bring together sustainable technologies and products, services, and businesses, always taking into consideration the environmental, social, and economic pillars (SILVEIRA *et al.*, 2016). Just as the ideal of sustainable development, eco-innovation is innovation that seeks to guarantee resources for the next generations (BISCOLI *et al.*, 2016).

Therefore, when innovation is oriented towards sustainable development, it includes the environmental, social as well as the economic aspects, demonstrating a focus on the environmental and social impacts of business activities or products and services, seeking to protect the environment while developing socially and economically. In this sense, innovation plays an important role in generating changes and creating new tools, making it possible to link economic development to policies that ensure social and environmental benefits.

1.2 Innovation and its relation to Smart Cities

Smart city initiatives are spreading around the world at a fast pace, seeking to increase the competitiveness of local communities through innovation, while improving the quality of life for citizens by offering better public services and an ecologically balanced environment.

Therefore, cities should invest in improving their efficient organization to increase wealth production towards sustainable development (KNIESS et al., 2019). Creativity and innovation involve not only cultural industries and research, but also the organizational structure of a city, which must become less pervasive (FUSCO GIRARD, 2013).

Smart cities represent an idea of where a city wants to be in the future and how it imagines itself transformed by leveraging the resources of digital technology and innovation networks from the widespread use of Information and Communication Technologies (ICTs) (ANGELIDOU et al., 2017).

In addition, smart cities strive to improve the competitiveness of local communities through innovation, while improving citizens' quality of life by offering better public services and a cleaner environment (KNIESS et al., 2019; APPIO; LIMA; PAROUTIS, 2019).

In this way, smart cities are first and foremost seen as "smart communities," collaborative ecosystems that promote innovation by creating connections between citizens, governments, businesses, and educational institutions (CONTI et al., 2019). These innovative clusters foster the development of high added value activities of the "knowledge economy." (APPIO; LIMA; PAROUTIS, 2019).

According to Jain and Rohrer (2022), factors such as climate change, population growth, natural resource scarcity and a high rate of urbanization have caused government leaders to seek alternative ways to manage and provide urban services such as water supply, energy, waste, etc. Especially in developing countries, these services are conventionally managed centrally and present several limiting factors. In this regard, tools such as ICTs can be used for better planning and management by governments and other partners (WEISS, 2019; BECK; CONTI, 2021).

The use of ICTs allows public management and the services provided to the population to be more transparent and makes urban environments more social and attractive for business. Thus, "public authorities, citizens, and organizations can interact to stimulate innovations in methods and technologies aimed at the development and improvement of urban dynamics, imprinting cities with greater intelligence" (WEISS, 2019, p. 244).

It is worth noting that urban environments, besides presenting challenges that call for innovative solutions, when well planned, favor synergy between individuals and diversified economic opportunities. In other words, they enhance urban vitality. These connections, which may at first seem trivial, favor the generation of social capital and innovation. Therefore, cities favor innovation, but it is important that places and establishments are planned with this goal in mind as well (CHEN et al, 2021). As pointed out by Sexenian (1996), regions such as the Silicon Valley in the state of California (USA) are favorable to innovation due to the interactions between people from different sectors and cultures that take place in the external environments of the companies located there.

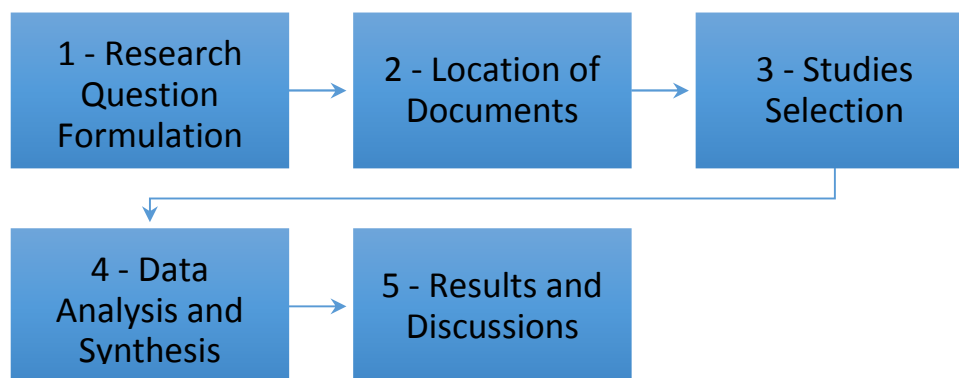
2 METHODOLOGY

It is known that in the academic world, literature review is an essential research feature and lays the foundation for the investigations of any study (XIAO; WATSON, 2019). But to delimit the boundaries of scientific knowledge on a given topic with precision, research with more rigorous prerequisites is required. A systematic literature review (SLR) is a specific methodology used to evaluate relevant contributions that fit previously established criteria on the topic at hand, so that conclusions can be drawn about the limits of what is or is not known (DENYER; TRANFIELD, 2009).

In this research, the SLR methodology was used (with the aid of bibliometric analysis) to identify and analyze relevant documents that addressed innovation as a requirement for the sustainable development of smart cities. Based on this analysis, possible research gaps and trends about the topic were presented and discussed.

In order to ensure reliability, accuracy, and transparency established by the methodologies, a five-step approach, characteristic of SLR, was used in this study: (1) Research question formulation; (2) location of documents (3) studies selection; (4) data analysis and synthesis; and (5) results and discussions. Figure.1 shows the search flow used.

Figure 1 - Study flow



Source: From authors (2022)

Firstly, the research question is formulated, which guides the entire SLR process: What is the role of innovation in the sustainable development of smart cities?

In the second phase, the search for documents begins. The Scopus database was chosen to develop this research because it is one of the largest scientific and technical databases in the world. Initially the keywords “smart cities, sustainable development, and innovation” were defined, represented in the Boolean expression below: (TITLE-ABS-KEY ("smart cities" OR "smart city") AND TITLE-ABS-KEY ("sustainable development") AND TITLE-ABS-KEY ("innovation")).

The collection took place on 5/23/2022. The articles that contained the terms in the title, abstract, or keywords formed the prior creation of the database. Three hundred and eighteen (318) articles were initially collected.

During the third phase, the research protocols were established. Inclusion and exclusion criteria were applied: only peer-reviewed articles published from 2012 to 2022 in English were taken into consideration. Any other published document has been excluded from the base. Thus, the base contained 123 articles.

In the fourth stage of SLR, a bibliometric study was performed with the help of software. The documents were coded and classified with Microsoft Excel according to the topic addressed, keywords, year of publication, and country of origin of the study. The network was formed using VOSviewer, software for constructing bibliometric networks (CHÁFER et al., 2021), with the most cited keywords for subsequent analysis and synthesis of the data. In this stage, graphs and tables were made for the graphical quantitative representation of the analyzed data.

The fifth phase of the SLR consisted in discussing the results, identifying the gaps, and pointing out possible future research in the field. In this stage, there was contribution of articles, websites, and books about the topic.

3 RESULTS AND DISCUSSIONS

The results of the bibliometric study based on the data collected will be presented in this section, as well as the discussions generated from the relations found in the literature on innovation, sustainable development, and smart cities.

3.1 Production of articles from 2012 and 2022

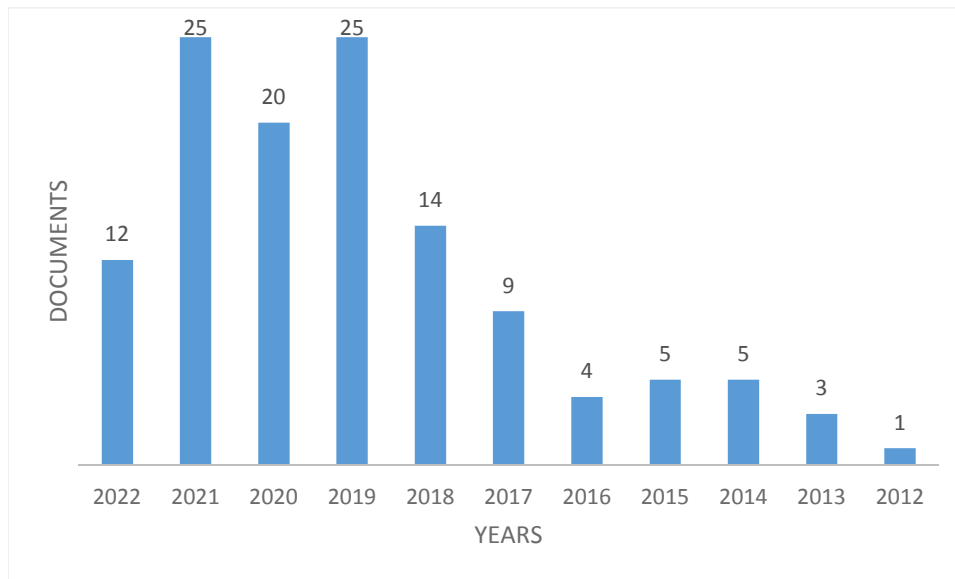
Following the research protocol, that is, considering only peer-reviewed articles, the first paper published on the topic was in 2012, which marks the beginning of the research. Figure 2 shows a significant growth of published documents. From 2017, the number of published articles increased considerably. The last five years of

**INNOVATION AND SUSTAINABLE DEVELOPMENT OF SMART CITIES:
A SYSTEMATIC REVIEW TO IDENTIFY RESEARCH TRENDS AND GAPS**

SOFIA DEODORO DOS SANTOS CAMATA, SILIANE VANESSA SARTORI, MARIANA MANENTE BETTINI, DIEGO DE MELO CONTI

the period (from 2017 to 2022) represents almost 85% of the total published articles. The year 2021, for example, includes 25 articles and shows a larger number than the sum of the first five years (from 2012 to 2016), which totals 18 documents.

Figure 2 - Relation of published articles per year



Source: From authors (2022)

Since this is considered a recent topic, the first document was published in 2012. This article discusses the role of smart applications in cities, especially as they promote better living and working conditions, new modes of participation, and a higher level of citizen involvement. It also explores the process of smart applications innovation and how they contribute to urban development (SCHAFFERS; RATTI; KOMNINOS, 2012).

3.2 Documents published by Region/Country

The study shows a large number of countries with published articles about the topic. Scopus reports 51 countries spread over the five continents, with greater representation in the northern hemisphere region (figure 3).

Italy leads the ranking, accounting for 18% of all documents published in the period, followed by China with 13%, and USA with 11%. Brazil ranks fourth along with India and the UK, each with 7% of the total articles published.

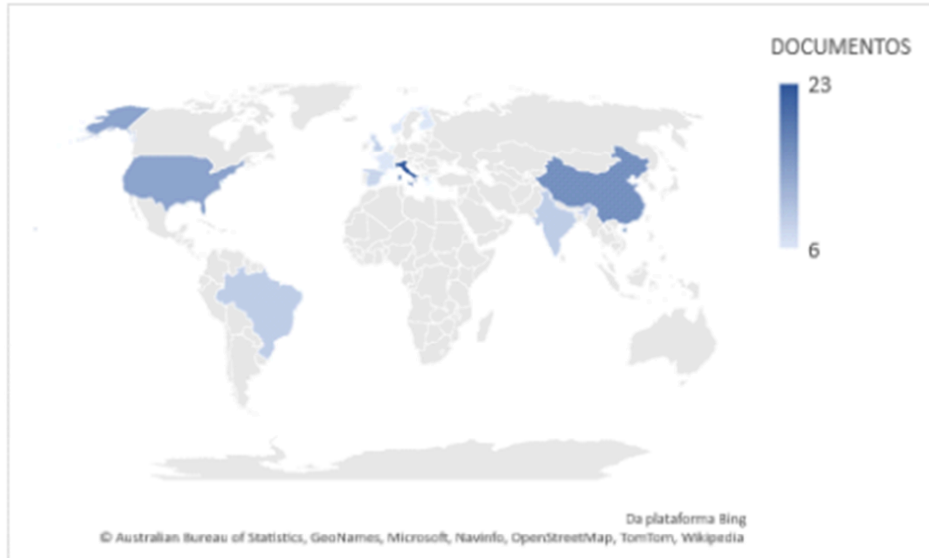
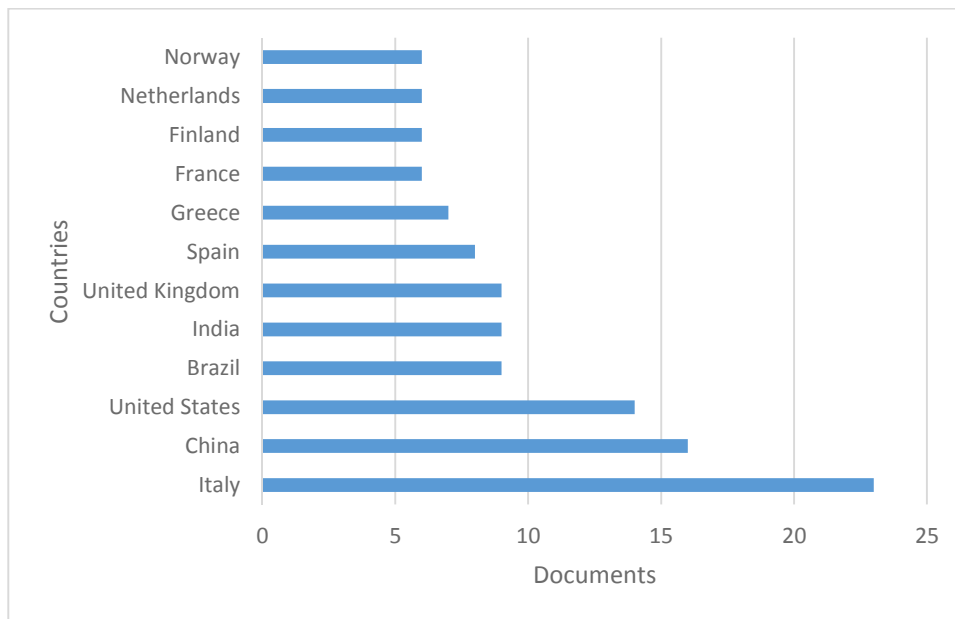


Figure 3 - Countries with published articles on the topic
Source: From authors (2022)

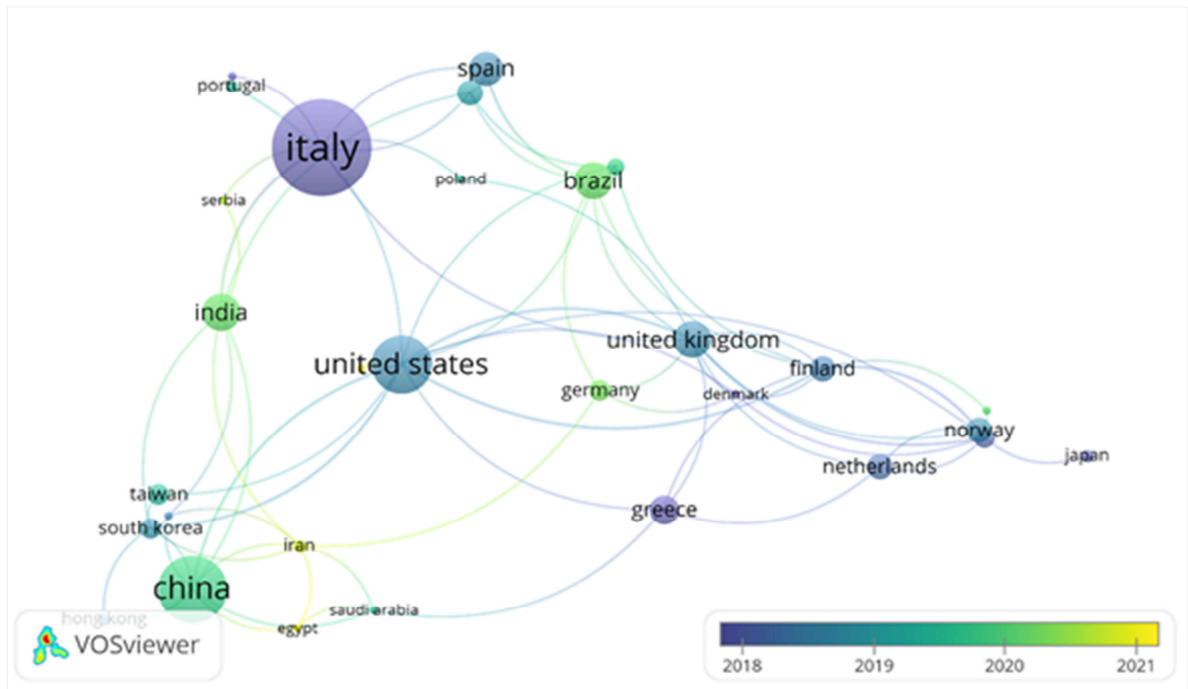
Figure 4- Ranking of published articles per region/country



Source: From authors (2022)

Figure 5 shows the network established by the countries that published about the topic during the period. The countries are represented by spheres. The larger the circumference, the greater the number of published articles. The lines connecting the countries indicate a cooperative relation in the studies. The colors, on the other hand, represent the incidence of publications from 2017 to 2021. In this case, the trend over the last five years was analyzed. That is, countries in yellow spheres represent countries with more recent studies, which may show the interest of these countries on the subject.

Figure 5 - Network publications and contribution between region/country



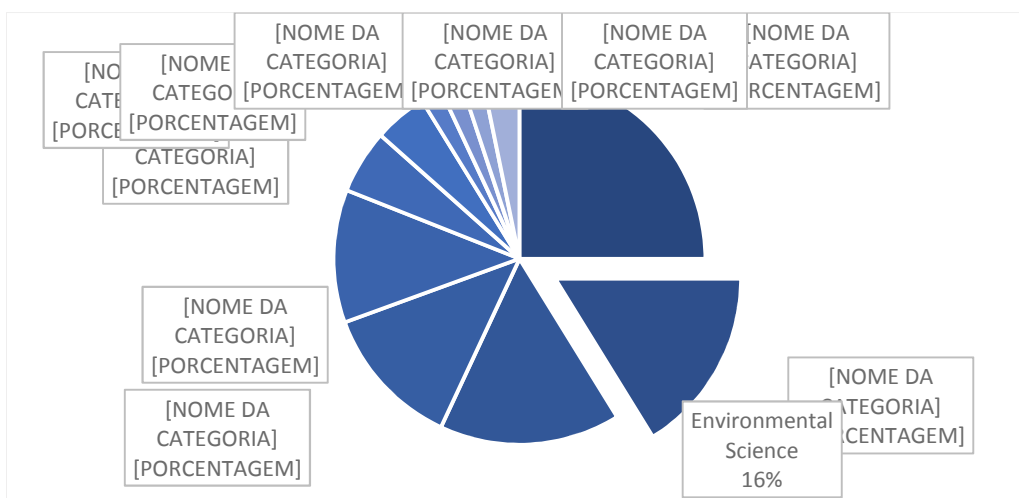
Source: From authors (2022)

It can be seen that Italy, the USA, and China have the largest volume of contributions on the topic. Brazil and Germany show an upward trend, and Iran and Egypt emerge with the first studies in their respective countries.

3.3 Documents by Subject Area

Figure 6 shows the distribution of articles by subject area. Social Sciences (25%), Energy (16%), and Environmental Science (16%) are the majority of topics of interest in publishing papers. But several other areas are present as well, such as Engineering (12%) and Business, Management and Accounting (12%). These varied categories show interdisciplinarity among several areas in the scientific production of the topic.

Figure 6 -Articles by subject area



Source: From authors (2022)

3.4 Keyword analysis to identify research gaps and trends

In a scientific research, keywords serve to identify the main subject matter addressed in the document. The repetition frequency of those words in a set of documents that make up the database marks the main topics discussed in those papers.

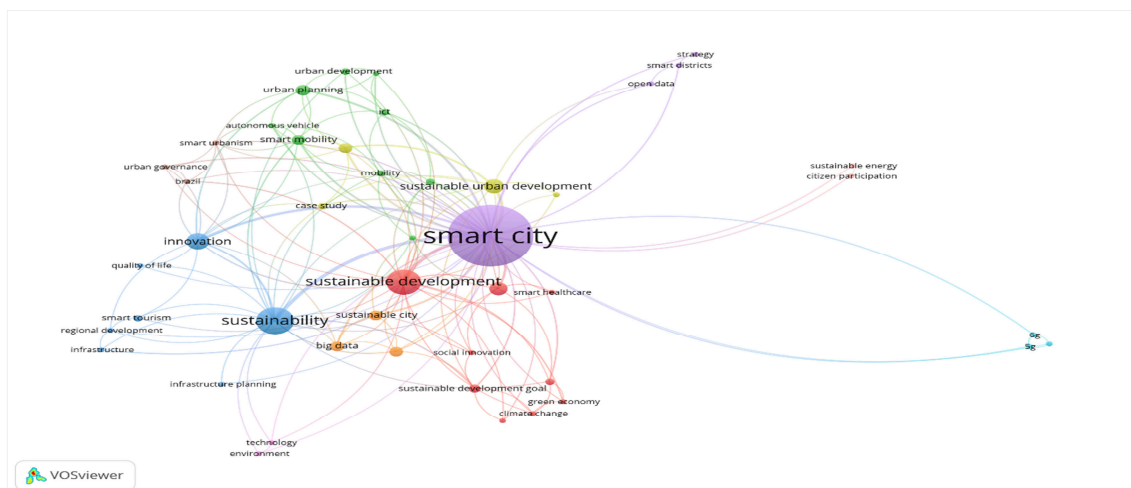
VOSviewer software was used to develop this network. This application creates relationship networks by means of clusters. In this analysis, the network was originated from the set of keywords selected by the authors from a previously established database. By studying this grouping, it was possible to establish the most incident topics when combining smart cities, innovation, and sustainable development.

To obtain a better approach and more efficient data interpretation, synonymous keywords were concatenated, for instance: "smart city" and "smart cities" had their occurrences added together because they are the same subject. When developing the keyword network, only keywords with a minimum occurrence of two times in the total number of documents were considered. This totaled 46 keywords (Fig. 7.)

We can see in figure 7 that the sizes of the spheres represent the occurrence of keywords. This means that the larger the sphere, the higher the incidences in the documents. In this analysis, keywords with the highest frequency are: "smart city" with 75 occurrences, "sustainability" with 23 occurrences, and "sustainable development" with 20 occurrences.

Figure 7 also shows the classification of the clusters in 10 colors. This color grouping establishes that the incidence of these keywords generally occurs in the same dominant theme. For example, keywords in the red cluster, such as "green economy", "climate change" and "renewable energy" are grouped in the same color because they generally appear in the same document, in other words, they are correlated due to their incidence. Another example is that the keyword "innovation" is clustered in blue and "sustainable city" in orange. In this study, these words did not relate in the same document as keywords defined by the author.

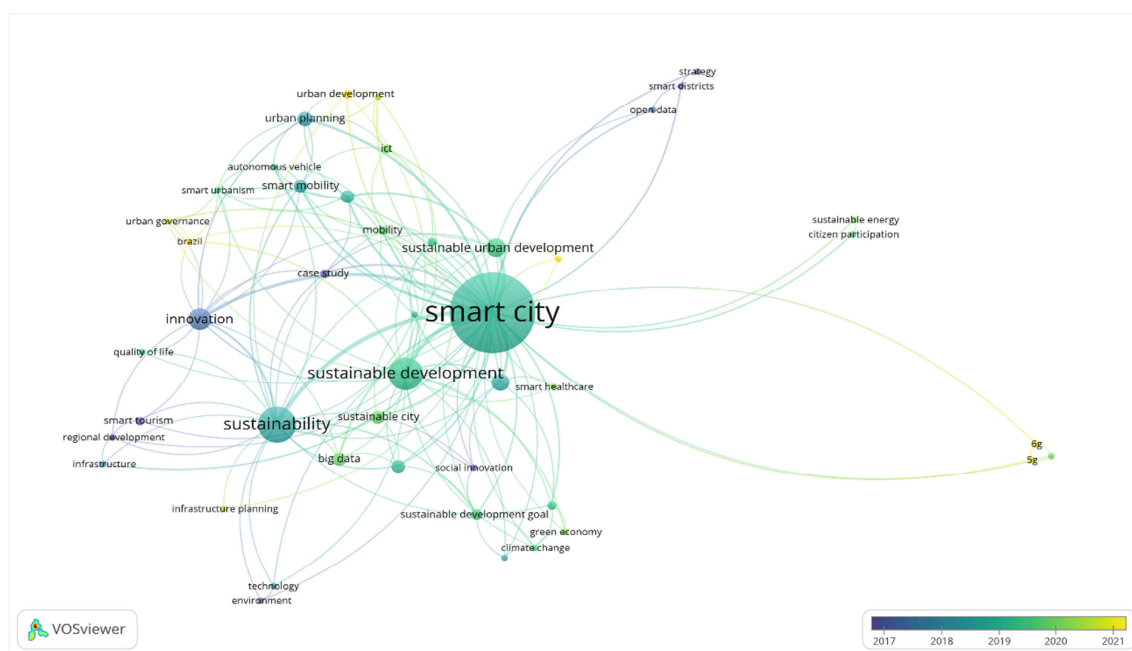
Figure 7 - Keywords network



Source: From authors (2022)

Another possible analysis is to understand the trends and gaps in research by looking at the frequency of keywords incidence over the past few years (Fig. 8.) The closer to the blue hue, the older the research is. On the other hand, the closer to the yellow hue, the more recent the research is.

Figure 8 - Keyword incidence network from 2018 to 2021



Source: From authors (2022)

Among the most recent studies, the term "big data" appears as a keyword in five documents. Even one of these studies published in 2020 had 53 citations, showing a research trend. The author considers that big data technologies have become essential for the functioning of cities and comments about their great potential to achieve sustainable urbanism (BIBRI; KROGSTIE, 2020). The most recently published document that contained "big data" as one of the keywords defined by the author, advocates the need for technological innovations in the implementation of solutions for cities' health-care systems. The author criticizes the fragility of health-care systems and evaluates a security module for handling this data using the Rivest Cipher 6 (RC6) encryption algorithm with a Computational Secret Sharing Scheme (CSIS) for distributed storage of clinical images (SAROSH et al., 2021).

Another prominent keyword indicating a research trend is "sustainable urban development", with nine (9) occurrences in the documents. The most relevant article has 101 citations and it was published in 2019. The author discusses which principles should be considered when implementing strategies to enable city development, and analyzes four cities that are considered leaders in smart city development: Amsterdam, Barcelona, Helsinki, and Vienna (MORA; DEAKIN; REID, 2019). Considering the same keyword, the most recently published paper discusses the research gap that analyzes the common urban challenges faced by local governments in developing smart cities (SOE; SARV; GASCO-HERNANDEZ, 2022).

As for the research gaps, the keyword "smart healthcare" only appears in two papers, both published in 2020. In one of them, although the word was cited 91 times, the author precisely outlines the research gap in the development of intelligent systems for monitoring the health of the population in third world countries. The author believes that remote health monitoring can contribute to improve well-being and lower expenses to human services such as hospitals (PAPA et al., 2020). The other article published on the topic is about the importance of optimizing information strategies in the intelligent healthcare sector, so that the reduction in healthcare costs does not sacrifice the quality of patient care.

Still referring to possible research gaps, the keyword "urban governance" appeared in two documents. One of them even reports that within the smart city topic, the scientific literature is still scarce in the basic understanding of the organizational transformations associated with city governance and public value generation. The research is the first step towards a better understanding of the dynamics relating information technologies and forms of governance in the transformation of cities through a public value management perspective (PEREIRA; LUNA-REYES; GIL-GARCIA, 2020).

CONCLUSION

The objective of this study was to analyze the role of innovation in the sustainable development of smart cities and discuss research gaps and trends on the topic.

This article not only shows the current state of scientific publications on "smart cities," "innovation," and their connections to sustainable development, but also stimulates thinking about the benefits of smart cities.

The current study helps researchers to increase their scientific production in these areas, which have a lot of research potential. There were limitations encountered in the development of this research as it is still a recent topic. There is significant difficulty in establishing the difference between what can be considered a "gap" and what may only be an approach that is still in the "discovery phase". Therefore, we propose for future research the contribution of approaches that bring more knowledge about the governance of urban centers and intelligent ways to manage public health.

Regarding the research trends detailed in the results section of this work, it can be considered an opportunity for researchers to go deeper into each one of the areas, analyzing more closely the applicability of such strategies.

ACKNOWLEDGMENTS

The authors would like to thank PUC-Campinas for the partial scholarship received during the course of their master's degrees *stricto sensu*.

REFERENCES

- Angelidou, Margarita. et al. Aprimorando o desenvolvimento urbano sustentável por meio de aplicativos de cidades inteligentes. *Journal of Science and Technology Policy Management*, 2017.
- Appio, F. P.; Lima, M.; Paroutis, S. Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. *Technological Forecasting and Social Change*, v. 142, p. 1-14, 2019.
- Araújo, C. A. A. Bibliometria: evolução histórica e questões atuais. *Em Questão*, v. 12 (1), 2006.
- Beck, D. F.; Conti, D. M. The Role of Urban Innovativeness, Smart Governance, and Smart Development in the Urban Smartness. *Humanidades & Inovação*, v. 8, n. 49, p. 141-151, 2021.
- Bento, S. C.; Conti, D. M.; Baptista, R. M.; Ghobril, C. N. As novas diretrizes e a importância do planejamento urbano para o desenvolvimento de cidades sustentáveis. *Revista de Gestão Ambiental e Sustentabilidade*, v. 7, n. 3, p. 469-488, 2018.
- Biribi, S. E.; Krogstie, J. The emerging data-driven Smart City and its innovative applied solutions for sustainability: the cases of London and Barcelona. *Energy Informatics*, v. 3, n. 1, 2020.
- Biscoli, F.R.V.; Silveira, A.D.; Carvalho, A.P.; Cunha, S.K. Dimensões daecoinovação em empresas instaladas nos parques tecnológicos do estado do Paraná. *Revista Competitividade e Sustentabilidade - ComSuS*. V3. N1. 2016.
- Cháfer, M. et al. Trends and gaps in global research of greenery systems through a bibliometric analysis. *Sustainable Cities and Society*, v. 65, n. October 2020, 2021.
- Chen, Z.; Dong, B.; Pei, Q.; Zhang, Z. The impacts of urban vitality and urban density on innovation: Evidence from China's Greater Bay Area. *Habitat International*. V119. 2022.
- Comissão Mundial sobre Meio Ambiente e Desenvolvimento - CMMAD. *Nosso Futuro Comum*. 2 ed. Rio de Janeiro: Editora da Fundação Getúlio Vargas, 1991.
- Conti, D. M.; Guevara, A. J. H.; Heinrichs, H.; Silva, L. F.; Quaresma, C. C.; Beté, T. S. Collaborative governance towards cities sustainability transition. *urbe. Revista Brasileira de Gestão Urbana*, v. 11, 2019.
- Correia, S. É. N. et al. Inovação Social para o Desenvolvimento Sustentável: um caminho possível. *Administração Pública e Gestão Social*, v. 10, n. 3, p. 199-212, 2018.
- Denyer, D.; Tranfield, D. Producing a Systematic Review *The SAGE Handbook of Organizational Research Methods*, 2009.

- Fusco Girardi, L. Toward a smart sustainable development of port cities/areas: The role of the “Historic Urban Landscape” approach. *Sustainability*, v. 5, n. 10, p. 4329-4348, 2013.
- Jain, M; Rohracher, H. Assessing transformative change of infrastructures in urban areas redevelopments. *Cities*. V124. 2022.
- Kniess C. T.; Aguiar A. O.; Conti, D. M.; Phillippi Jr., A. Inovação urbana e recursos humanos para gestão de cidades sustentáveis. *Estudos Avançados*, v. 33, p. 119-136, 2019.
- Koroneos, C. J.; Rokos, D. Sustainable and integrated development—A critical analysis. *Sustainability*, v. 4, n. 1, p. 141-153, 2012.
- Mora, L.; Deakin, M.; Reid, A. Strategic principles for smart city development: A multiple case study analysis of European best practices. *Technological Forecasting and Social Change*, v. 142, n. March 2018, p. 70–97, 2019.
- Papa, A. et al. E-health and wellbeing monitoring using smart healthcare devices: An empirical investigation. *Technological Forecasting and Social Change*, v. 153, p. 119226, Apr. 2020.
- Pereira, G. V.; Luna-Reyes, L. F.; Gil-Garcia, J. R. Governance innovations, digital transformation and the generation of public value in Smart City initiatives. *Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance*. New York, NY, USA: ACM, 23rd Sept. 2020. Available at: <https://dl.acm.org/doi/10.1145/3428502.3428592>.
- Santos, B. A.; Brandão, M. Redalyc. Estudo bibliométrico: orientações sobre sua aplicação. 2016.
- SAROSH, P. et al. Secret Sharing-based Personal Health Records Management for the Internet of Health Things. *Sustainable Cities and Society*, v. 74, 2021.
- Saxenian, A. *Regional advantage: Culture and competition in Silicon Valley and route 128*. Harvard University Press. 1996.
- Schaffers, H.; Ratti, C.; Kominos, N. Special issue on smart applications for smart cities - new approaches to innovation: Guest editors' introduction. *Journal of Theoretical and Applied Electronic Commerce Research*, v. 7, n. 3, 2012.
- Schumpeter, J. *A teoria do desenvolvimento econômico*. Nova Cultural, São Paulo, 1988.
- Silveira, L.M.; Dalmarco, G.; Petrini, M.; Neutzling, D.M. Inovação e Desenvolvimento Sustentável: uma análise sistemática da produção científica internacional. Developed by: *Revista de Gestão Unilasalle*. V5. N1. 2016.
- Soe, R. M.; Sarv, L.; Gasco-Hernandez, M. Systematic Mapping of Long-Term Urban Challenges. *Sustainability*, v. 14, n. 2, p. 817, 12 Jan. 2022.
- UN-Habitat. *World Cities Report 2020 – The Value of Sustainable Urbanization*. Available at: <https://bit.ly/3mZrKWw>. (Accessed: 15 May 2022).
- Weiss, M.C. Cidades Inteligentes: proposição de um modelo avaliativo de prontidão de tecnologias da informação e comunicação aplicáveis à gestão urbana. *Revista Brasileira de Gestão e Desenvolvimento Regional*. V15. N4. P. 243- 265. Taubaté, SP, Brasil. 2019.
- Xiao, Y.; Watson, M. Guidance on Conducting a Systematic Literature Review. *Journal of Planning Education and Research*, v. 39, n. 1, p. 93–112, 2019.