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SUSTAINABLE COMMUNITY DEVELOPMENT - APPLICABILITY AND GLOBAL CONTEXTUALIZATION OF URBAN INDICATORS

DESENVOLVIMENTO SUSTENTÁVEL DE COMUNIDADES - APLICABILIDADE E CONTEXTUALIZAÇÃO GLOBAL DOS INDICADORES URBANOS

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ABSTRACT

Purpose – The need to plan and manage cities is increasingly aligned with the search for sustainable development in all its dimensions. Countless initiatives and tools aim to assist in this process, as is the case of urban indicators, which serve as a basis for measuring, analyzing and understanding the context of cities. In this sense, the main objective of this article is to understand and analyze the context and application of one of these tools, ISO 37120 - Sustainable Development of Communities: Indicators for urban services and quality of life. ISO 37120 is an internationally recognized standard, composed of integrated urban indicators, which balance three dimensions of sustainable development; in addition, the standard allows the implementation of smart city initiatives.
Design/methodology/approach – Documentary research was used and, subsequently, a critical analysis was carried out, from which positive and negative points were identified in relation to the application of ISO.
Findings – Results demonstrate the increasing use of ISO 37120 as a way of measuring urban indicators; however, there is still difficulty in continuing to validate the methodology after the first certification. In addition, it was found that most of the certified cities are national capitals, cities that have also been looking for alternatives to become more intelligent and sustainable.
Originality/value – The operation of ISO 37120 certification was presented, as well as some weaknesses and potentialities of this certification system, which aims to assist in the solution of main urban issues, building smarter, more sustainable and resilient cities.

Keywords - Urban Indicators, Sustainable Development, Smart Cities, Public Administration.

RESUMO

Objetivo – A necessidade de planejar e gerir as cidades está cada vez mais alinhada com a busca pelo desenvolvimento sustentável em todas suas dimensões. Inúmeras iniciativas e ferramentas visam auxiliar nesse processo, como é o caso dos indicadores urbanos, que servem de subsídio para medir, analisar e compreender o contexto das cidades. Nesse sentido, o objetivo principal deste artigo é compreender e analisar o contexto e a aplicação de uma dessas ferramentas, a ISO 37120 - Desenvolvimento Sustentável de Comunidades: Indicadores para serviços urbanos e qualidade de vida. A ISO 37120 é uma normativa reconhecida internacionalmente, composta por indicadores urbanos integrados, que equilibram as três dimensões do desenvolvimento sustentável, ademais, a normativa possibilita a efetivação de iniciativas de cidades inteligentes.
Metodologia – Pesquisa documental e, posteriormente, realizou-se uma análise crítica, a partir da qual foram identificados pontos positivos e negativos em relação à aplicação da ISO.
Resultados – Os resultados demonstram a crescente utilização da ISO 37120, como forma de medir os indicadores urbanos, porém, ainda há dificuldade em dar continuidade à validação da metodologia após a primeira certificação. Além disso, constatou-se que grande parte das cidades certificadas são capitais nacionais, cidades que também têm buscado alternativas para tornar-se mais inteligentes e sustentáveis.
Originalidade – O funcionamento da certificação ISO 37120 foi apresentado, bem como algumas fraquezas e potencialidades desse sistema de certificação, que visa auxiliar na solução das principais problemáticas urbanas, construindo cidades mais inteligentes, sustentáveis e resilientes.

Palavras-chave - Indicadores Urbanos, Desenvolvimento Sustentável, Cidades Inteligentes, Gestão Pública.

1 INTRODUCTION

Planning, managing and governing cities have been a major challenge for public managers today. The intense urbanization since the last century has been a fundamental factor in this scenario. According to a study released by World Urbanizations Prospects, organized by the United Nations (WUP ONU, 2018), about 55% of the world population lives in urban areas, and the prospects point out that this percentage will reach 66% in 2050. In Brazil, this urbanization process is even more intense, since today the urban population reaches the level of 86%, with future predictions of reaching 92% of the population residing in urban centers in the year 2050 (WUP ONU, 2018).

High urban concentration brings numerous challenges to cities to meet the needs of growing population, starting with basic items related to health, education, work, basic sanitation and housing, also covering new demands such as mobility, sustainability and resilience (BOUSKELA, CASSEB, BASSI, DE LUCA & FACCHINA, 2016).

To meet these needs, city managers must foster innovation in specific areas, in order to promote growth on the Triple Bottom Line (HOLLANDS, 2008). The Triple Bottom Line (TBL) is a concept disseminated by John Elkington (1994). According to the author, sustainable development is based on the correlation of three dimensions: social, economic and environmental. Furthermore, the author approaches the concept of corporate social responsibility to the issue of sustainability, focusing on decisions and actions related to organizational management (PAZ & KIPPER, 2016; OLIVEIRA, DERRETTI & DULLIUS, 2017).

Another author who contemplates the concept of sustainable development is Ignacy Sachs (2002), who presents a more complex approach, defending the existence of five dimensions of sustainability: social, economic, ecological, spatial, and cultural (SACHS, 2002; OLIVEIRA et al., 2017).

Equally for Elkington (1994) and Sachs (2002), the search for sustainability and sustainable development must be built in a harmonious way, in order to make social, economic and environmental goals compatible, requiring efforts from all actors involved. Impelled by these thoughts, their proposal is to give an enduring meaning to the city, which emerges, grows and transforms, establish-

ing relationships between humans and the environment as a whole (MARTINS & CÂNDIDO, 2015).

Also related to the concept of sustainable development are Smart Cities. Smart Cities are initiatives that use Information and Communication Technologies (ICTs) to optimize urban dynamics. As disseminated by the International Telecommunication Union (ITU) in the technical report "Smart Sustainable Cities: An analysis of definitions", the concept of Smart Cities can be understood as:

> A sustainable smart city is an innovative city, which uses Information and Communication Technologies (ICTs) and other means to improve the quality of life, efficiency of urban operations and services, and competitiveness, ensuring that it meets the needs of present and future generations, respecting economic, social and environmental aspects (ITU, 2014, p.13).

This idea of respect and prioritization of social, economic and environmental development is also reaffirmed in the definition of Smart Cities by the authors Gil-Garcia, Pardo and Nam (2015) who believe that Smart Cities should excel in the combination, integration and interconnection of systems and infrastructure, allowing social, cultural, economic and environmental development, as well as, should seek a better future, quality of life and more sustainable cities. Both concepts permeate the issue of searching for a better, sustainable, prosperous and with quality of life future. In this sense, the development of Smart Cities is based on the pillars of sustainability, in search of a more sustainable, intelligent and balanced development (HARA, NAGAO, HANNOE & NAKAMURA, 2016).

To apply the proposed concept for Smart Cities and other initiatives that seek sustainability, it is necessary to recognize the reality and the intrinsic characteristics of cities. Jacobs (2011) highlights that it is essential to understand the principles that underlie the behavior of cities, whose success is in taking maximum advantage of their characteristics, taking advantage of potential strengths, so as not to act contrary to them.

In this context, indicators aimed at urban development indexes are important tools for city planning, and formulation of public policies, as they allow the assessment and monitoring of the dynamics of urban centers. In this way, indicators serve as a subsidy for measuring and understanding the *status quo*[1] of a territorial parcel (LEITE & AWAD, 2012).

According to Llacuna, Llinás and Frigola (2015), ECO 92[2] represented a major milestone in urban monitoring, where the role of cities in the path of sustainability was highlighted. In 1994, the Aalborg Charter was drawn up, as a result of the 1st European Cities Sustainability Conference and ratified by more than 1200 cities worldwide. It is also worth mentioning the Local Agenda 21 initiative, which consisted of a set of indicators to monitor sustainability, and was developed by each of the signatories, considering the context of their own cities (BENCKE & PEREZ, 2018).

In 2015, the United Nations (UN) together with 193 countries implemented the 2030 Agenda, which consists of an action plan with 17 Sustainable Development Goals (SDGs). Regarding sustainable cities and communities, Objective 11 is highlighted, which aims to: "Make cities and human settlements inclusive, safe, resilient and sustainable" (UN, p.267, 2015). Objective 11 aims to significantly transform the construction and management of urban space in favor of Sustainable Development, themes related to urbanization, mobility, solid waste management and basic sanitation are included in the goals of this Objective (UN, 2015).

The SDGs, as well as the international standard (ISO 37120), involve the three dimensions of sustainability: environmental, social and economic. Bearing in mind that ISO 37120 and the SDGs

1 Status quo = expression derived from the Latin meaning "current state".
2 Eco 92: United Nations Conference on Environment and Development, held in June 1992, in Rio de Janeiro.

consider sustainability as a general principle, and resilience as a guiding concept in the development of cities, the use of indicators is essential as a facilitating tool for city planning and management (RIBEIRO, 2019).

Thus, with guidelines aimed at sustainability in the urban environment, several initiatives have emerged in order to measure the quality of life of the population and urban services through indicators. Among the most publicized indexes, it is possible to mention the European Smart Cities[3], a model that since 2007 evaluates European cities, based on 74 indicators. At the national level, since 2015 Urban Systems has annually published the Ranking Connected Smart Cities[4], which maps and classifies cities in Brazil through 70 indicators. Another national initiative is the Sustainable Cities Program[5](PCS), which includes 260 indicators, which are directly related to the Sustainable Development Goals (SDGs).

In this context, ISO 37120 - Sustainable Community Development: Indicators for urban services and quality of life - brings a new proposal, which uses a method and application different from the models and rankings mentioned (ISO, 2014). Therefore, this work aims to carry out a documentary research about ISO 37120. Through an exploratory analysis it was sought to understand the methodology, processes of validation and certification, as well as the current context of this standard in a global scope. In addition, through a critical analysis, we sought to identify some positive and negative aspects of this model of sustainability indicators in the urban environment.

2 METHODOLOGY

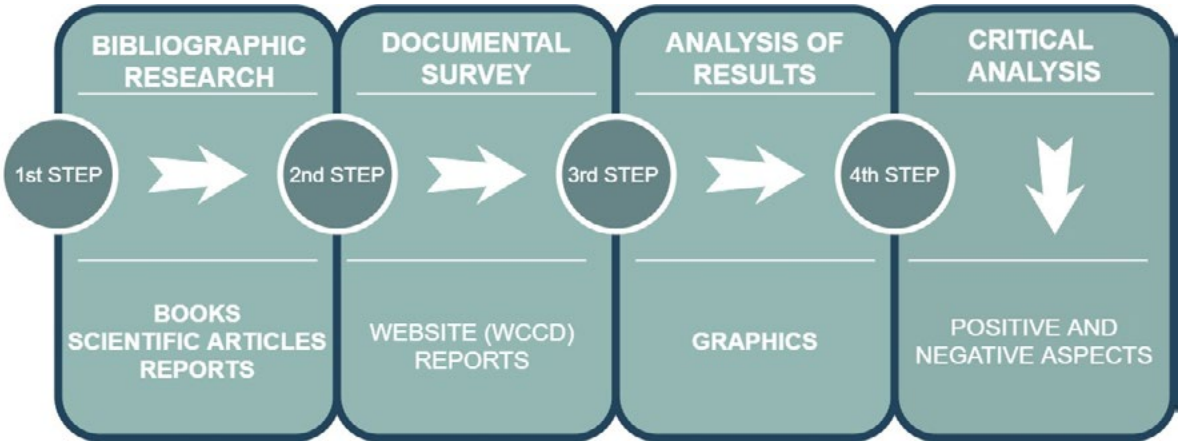
The development of the work was based on documentary research, as it seeks to investigate ISO 37120 and its application methodology. According to Gil (1999), the documentary research is developed using source materials (data) that have not yet received an analytical treatment. When the nature of the research is approached, it is classified as exploratory, since it involves familiarization with an international normative structure, in order to understand its methodology, applicability, positive and negative aspects (SILVA & MENEZES, 2005).

To carry out the research, a bibliographical survey was carried out, based on books, scientific articles and reports, aiming to gather knowledge already produced about the general theme of the work. Most of the information and data were collected through access of websites of the responsible entities, which constantly disseminate their information and updates.

Subsequently, based on the theoretical contribution and data collected, an analysis of the results was carried out with the generation of graphs in order to present the analysis in a more summarized and visual way. Finally, from the analysis of the results, a critical analysis was carried out, seeking to highlight positive and negative aspects of ISO 37120 indicators application . Figure 1 presents the methodological steps used in the preparation of this article.

3 European Smart Cities - Retrieved on July 20, 2019 from http://www.smart-cities.eu/.
4 Ranking Connected Smart Cities - Retrieved on July 20, 2019 from https://www.connectedsmartcities.com.br/
5 Sustainable Cities Program - Retrieved on July 20, 2019 from https://www.cidadessustentaveis.org.br/.

Figure 1 - Steps in the methodology.



Source: Prepared by the authors (2019).

3 THE ISO 37120

In the mid-1940s, when authorities from various countries met to discuss ways that could facilitate the unification of industrial standards, the entity that brings together the standardization/ normalization unions, known as ISO - International Organization for Standardization (ISO, 2019), was born. Currently, 162 countries use this certification system, which approves international standards in several areas, covering different interests. Brazil has been a member of the entity since its foundation in 1947, and since then it has been using ISO methodologies and processes, which is also a reference for the Brazilian Association of Technical Standards (ABNT, 2019).

ISO standards have become known for implementing regulations that aim at quality management processes, aimed at companies and products. In this sense, ISO 37120 is innovative, since it was the first to cover the theme of cities, which can be defined as dynamic, complex, constantly changing environments, composed of multiple actors (ALMEIDA & GONÇALVES, 2018).

ISO 37120 has the primary objective of sustainability. To this end, it developed a model that assists in measuring the performance of municipal services and quality of life of city dwellers. In addition, ISO 37120 allows the comparison of a wide range of performance indicators, disseminating and sharing the best practices and initiatives developed in cities (BENCKE & PERES, 2018; WCCD, 2019).

The implementation of ISO 37120 - Indicators for Municipal Services and Quality of Life is done in partnership with the World Council on City Data (WCCD, 2019). WCCD platform is known for formulating standard metrics for city data, and aims to develop smarter, more sustainable, resilient and prosperous cities. When certified, cities have their data hosted on the WCCD platform, where they can be consulted and compared with other registered cities.

With an international scope, ISO 37120 is applicable to any city, municipality or local government that intends to measure its performance in a comparable and verifiable way, regardless of size and location. By providing a set of indicators, and the method of measuring them, ISO 37120 can be applied at a global level, and this method is feasible anywhere. In this sense, ISO 37120 has a greater reach when compared to other models, since the others are restricted to specific contexts, such as location, size of the city, among other peculiarities (ALMEIDA & GONÇALVES, 2018; WCCD, 2019).

Another important characteristic that can be highlighted in relation to ISO 37120 is that it does not make judgment, nor does it define a threshold or target numerical value for the indicators (ISO, 2014), which is frequent in other models, which usually disseminate classifications and rankings of the cities analyzed. Instead, ISO 37120, as mentioned earlier, provides cities with a compari-

son of their indicators with other certified cities, promoting successful practices, so that they can be taken as an example in building more sustainable cities.

As for its structure, ISO 37120 is formed by 17 major thematic axes, focusing on sustainability issues and major urban themes such as Mobility, Security, Health and Housing. The thematic axes also comprise areas of Economics, Education, Energy, Environment, Finance, Fire and Emergency Response, Governance, Recreation, Solid Waste, Telecommunications and Innovation, Urban Planning, Sewage, Water and Sanitation (ALMEIDA & GONÇALVES, 2018 ; BENCKE & PERES, 2018; WCCD, 2019). Figure 2 shows the list of axes that make up ISO 37120.

Figure 2 - Axes of ISO 37120.

Source: Prepared by the authors (2019).

The 17 thematic axes that are part of ISO 37120 are composed of 100 indicators, as shown in Table 1. Of this total, 46 indicators are classified as Core, that is, they are directly related to economic, social and environmental aspects. The other 54 are classified as supporting indicators, which serve as support for Core indicators, and are related to secondary issues that do not directly impact urban dynamics.

Table 1- Composition of Thematic Axes (Core Indicators / Supporting Indicators)

THEMATIC AXIS	CORE INDICATORS	SUPPORTING INDICATORS
Urban Planning	• Green Area	• Trees planted • Informal settlements • Employment / Housing Ratio
Residual Waters	• Wastewater collection • Wastewater without any treatment • Primary wastewater treatment • Secondary Wastewater Treatment • Tertiary effluent treatment	
Water and Sanitation	• Drinking Water Service • Access to water • Access to sanitation • Domestic water consumption	• Total water consumption • Water service interruptions • Water loss
Economy	• Unemployment rate • Commercial and industrial property values • Population living in poverty	• Full-time employment • Youth unemployment rate • Number of trades • Number of new patents
Education	• Students enrolled • Completion of Primary Education • Completion of Secondary Education • Student / teacher relationship	• Male students enrolled • Total student enrollment • Number with Higher Education
Energy	• Use of residential energy • Authorized Electrical Service • Use of electricity in Public Buildings • Electricity from renewable sources	• Total electrical use • Electrical interruptions • Duration of electrical outage
Environment	• Concentration of PM 2.5 • PM 10 concentration • GHG emission	• NO_2 concentration • SO_2 concentration • O_3 concentration • Noise Pollution • Extinction of native species
Finance	• Debt Ratio	• Capital expenditures • Own revenue • Taxes collected
Fire and Emergency Response	• Number of Firefighters • Number of fire-related deaths • Number of deaths related to natural disasters	• Volunteer firefighters • Emergency response time • Fire response time
Governance	• Voter participation rate • Number of women elected	• Women employed in government • Number of convictions for corruption • Citizen representation • Number of registered voters
Health	• Life expectancy • Hospital beds • Number of doctors • Mortality rate	• Number of nurses / midwives • Number of mental health professionals • Suicide rate

Recreation		• Indoor recreation space • Outdoor recreation space
Safety	• Number of police officers • Number of homicides	• Property crime number • Police response time • Number of violent crimes
Shelter	• Population living in slums	• Number of homeless people • Unregistered households
Solid Waste	• Residential solid waste collection • Solid waste collected • Recycled solid waste	• Landfill disposal • Incinerator disposal • Burning disposal • Open dump disposal • Other way disposal • Hazardous waste generated • Hazardous waste recycled
Telecommunication and Innovation	• Internet connection • Connection with cell phone	• Fixed connection
Transportation	• High-capacity public transport • Fast public transport • Public transport travel • Number of cars	• Sharing modes • Number of two-wheeled vehicles • Bike paths • Traffic deaths • Central area connectivity

Source: Adapted by the authors based on WCCD, 2019.

ISO 37120 certification levels occur according to the number of indicators reported by cities, offering a wide range of certification levels. The greater the number of Core and Supporting Indicators assigned, the higher the level of certification. Classification levels granted by ISO 37120 are: Aspirant, Bronze, Silver, Gold and Platinum, as shown in Figure 3.

Figure 3 - ISO 37120 Certification Levels

Source: Adapted by the authors based on WCCD, 2019.

ISO 37120 certification is valid for one year, which means that to continue with the certification, the city must renew its purchase annually. During the period of validity of the certification, the city has its data hosted on the WCCD, where it can be consulted and compared with other cities.

For the acquisition of the model, with data collection framework and methodology, the costs could reach 150,000 USD per municipality (BENCKE & PERES, 2018; WCCD, 2019).

In Brazil, ISO 37120 went through a translation and adaptation process, being called NBR ISO 37120 (NBR ISO 37120, 2017). This procedure meant that some indicators were adapted to the local reality. The standard was published in January 2017, and has been used ever since. The Brazilian Network of Smart and Human Cities (RBCIH) uses NBR ISO 37120 as basis for creating a Brazilian Index of Smart and Human Cities and the Certification Seal (RBCIH, 2017). The Connected Smart Cities Ranking, as of the 2019 edition, uses the methodology of NBR ISO 37120 together with ISO 37122 which is derived from it to prepare the Brazilian ranking.

4 ISO 37120 ANALYSIS AND RESULTS

Since its creation in May 2014, ISO 37120 has been certifying cities on different continents. In this study, 67 certified cities were identified with data available on WCCD. Table 2 shows the list of cities, countries where they are located, year of certification, as well as the level of ISO 37120 certification.

Table 2 - Cities certified by ISO 37120 ordered by year of classification.

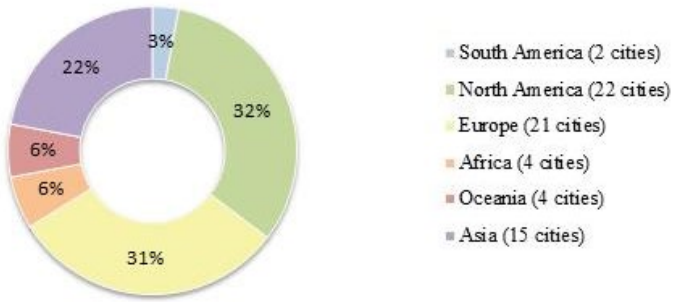
CITY	COUNTRY	YEAR OF CERTIFICATION	CERTIFICATION LEVEL
Amsterdam	Netherlands	2014/2015/2016	Asp./Gold
Bogota	Colombia	2014	Aspirational
Haiphong	Vietnam	2014	Aspirational
Helsinki	Finland	2014/2015	Asp./Gold
Johannesburg	South Africa	2014/2016	Aspirational
Minna	Nigeria	2014	Aspirational
Shanghai	China	2014	Aspirational
Buenos Aires	Argentina	2014/2015/2016	Gold /Plat.
Makkah	Saudi Arabia	2014/2015	Gold /Plat.
Melbourne	Australia	2014/2015/2016/2017	Gold /Plat.
Amman	Jordan	2014/2015	Platinum
Barcelona	Spain	2014	Platinum
Boston	EUA	2014/2015/2016/2017/2018	Platinum
Dubai	United Arab Emirates	2014/2015	Platinum
Guadalajara	Mexico	2014/2015/2016	Platinum
London	United Kingdom	2014/2015	Platinum
Makati	Philippines	2014/2015	Platinum
Rotterdam	Netherlands	2014	Platinum
Toronto	Canada	2014/2015/2016	Platinum
Los Angeles	EUA	2015/2017	Platinum
Vaughan	Canada	2015/2016	Platinum
Leon	Mexico	2015	Platinum
Shawinigan	Canada	2015/2016/2017	Platinum
Taipei	Taiwan	2015/2016/2017/2018	Platinum
Tshwane	South Africa	2016	Aspirational
Cape Town	South Africa	2016	Aspirational
Porto	Portugal	2016/2017	Gold/ Platinum
Jamshedpur	India	2016/2017	Gold/Silver
Surat	India	2016	Gold
Riyadh	Saudi Arabia	2016	Gold
Saint-Augustin-de-Desmaures	Canada	2016/2017	Platinum
San Diego	EUA	2016	Platinum
Surrey	Canada	2016	Platinum
Koprivnica	Croatia	2016	Platinum
Zagreb	Croatia	2016	Platinum
Cambridge	Canada	2016/2017	Platinum
Eindhoven	Netherlands	2016	Platinum
Heerlen	Netherlands	2016	Platinum
Pune	India	2016/2017	Platinum / Gold

Brisbane	Australia	2016/2017/2018/2019	Platinum
Oakville	Canada	2016/2017/2018	Platinum
Doral	EUA	2016/2017	Platinum
Torreón	Mexico	2016	Platinum
Oslo	Norway	2016	Platinum
Gdynia	Poland	2017/2018	Aspirational
Ciudad Juárez	Mexico	2017	Aspirational
Aalter	Belgium	2017/2018	Platinum
Sintra	Portugal	2017	Platinum
Zwolle	Netherlands	2017	Platinum
Hague	Netherlands	2017	Platinum
Tainan City	Taiwan	2017/2018	Platinum
Quebec City	Canada	2017/2018	Platinum
Kielce	Poland	2017	Platinum
Tbilisi	Georgia	2017	Platinum
Portland	EUA	2017	Platinum
Ahmedabad	India	2017	Platinum
Vijayawada	India	2017	Platinum
Yanbu Al Sinaiyah	Saudi Arabia	2017	Platinum
Annapolis Valley	Canada	2018	Gold
Piedras Negras	Mexico	2018	Platinum
Beme	Canada	2018	Platinum
Mississauga	Canada	2018	Platinum
Whitby	Canada	2018	Platinum
Kópavogur	Iceland	2018	Platinum
Warsaw	Poland	2018	Platinum
Guadeloupe	Mexico	2019	Platinum
Guelph	Canada	2019	Platinum

Source: Prepared by the authors based on WCCD (2019).

Cities certified by ISO 37120 are distributed on six continents, reaffirming the prerogative of worldwide coverage. This data also reinforces the global concern of city and country managers with the urban environment and the future of cities. Graph 1 shows where participating cities are located.

Graph 1 - Location of Certified Cities

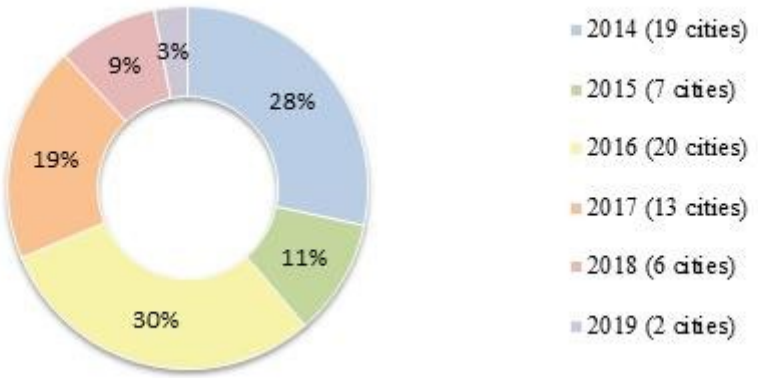


Source: Prepared by the authors based on WCCD (2019).

From data presented in Graph 1, it can be seen that most of the certified cities are in Europe, North America and Asia. Continents of South America, Africa and Oceania have few certified cities to date. It is also noteworthy that the representatives of the South American continent are capitals Buenos Aires and Bogotá. No Brazilian representative appears on the list of certified cities until 2018, however, the city of Campinas-SP has expressed interest in participating in the ISO 37120 certification, since it strenghtens the strategic planning entitled Campinas Smart City 2019-2029 (MUNICIPALITY OF MUNICIPAL DE CAMPINAS, 2019).

New cities are registered each year and are included in the ISO 37120 certification list. In 2014, the year in which ISO was launched, there was a spike in membership registrations with 19 cities. Subsequently, there were many variations in the number of cities that applied the ISO 37120 methodology for the first time, reaching the highest record in 2016, with 20 new certified cities. Such data are represented in Graph 2.

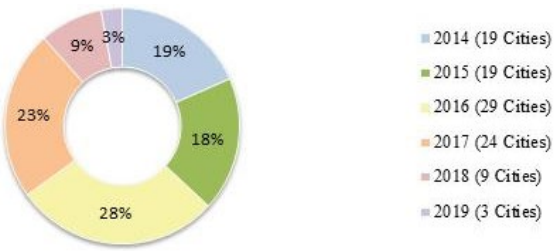
Graph 2 - Year of the 1st Certification



Source: Prepared by the authors based on WCCD (2019).

As we can see in Graph 2, since 2017 the number of new certified cities has been reducing. In 2018, six cities joined the ISO 37120 certification for the first time. In 2019, until the time of this research, only two new cities were included among the new ones certified with this methodology. In addition to the cities certified for the first time, many end up renewing the certification later. In this sense, there is greater equity in the total number of certifications per year. Cities like Melbourne (Australia), Shawinigan (Canada), Guadalajara (Mexico) and Buenos Aires (Argentina) have renewed their ISO 37120 certification for three consecutive years. The city of Brisbane (Australia) used the certification for four consecutive years, being the fourth validation in 2019. These data are shown in Graph 3.

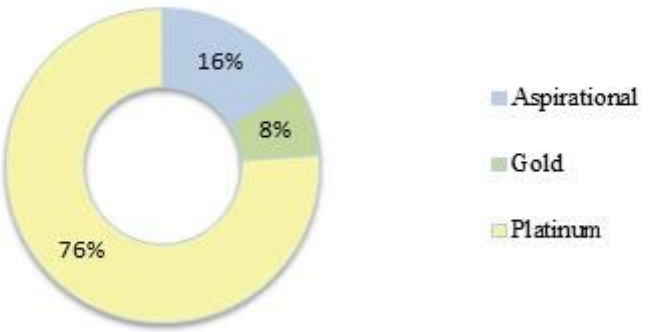
Graph 3 - Total cities certified by year



Source: Prepared by the authors based on WCCD (2019).

As previously seen, there are five ISO 37120 Seal Classification categories: Aspirant, Bronze, Silver, Gold and Platinum. The 67 cities studied in this work appear at three different levels of certification, 51 cities are at the highest level of certification, the Platinum seal, 5 received the Gold seal, and another 11 were certified with the Aspirant seal. As shown in Graph 4.

Graph 4 - ISO 37120 Classification Seal of 67 Classified Cities



Source: Prepared by the authors based on WCCD (2019).

After the first certification, some cities renew the certification to maintain the ISO 37120 Seal, but this practice is not common, as the vast majority of certified cities end up not applying the proposed methodology again. Of the 67 cities analyzed, more than half were certified only once, as shown in Graph 5.

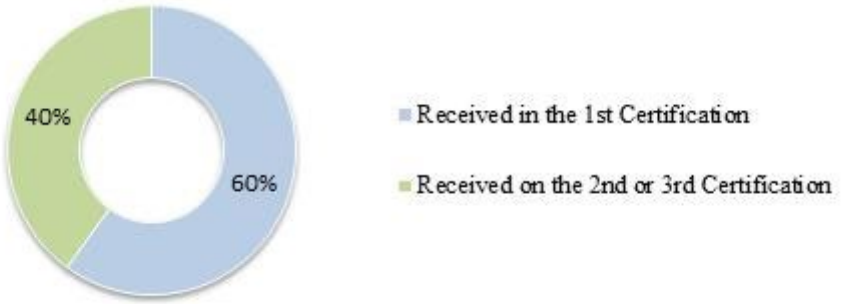
Graph 5 - Number of Certifications performed by City

Source: Prepared by the authors based on WCCD (2019).

One of the factors that impels cities to seek renewal of their certification is the aim of achieving a higher category seal. As an example of this situation, Amsterdam obtained the Aspirant seal in its first certification in 2014, and in the following year, after applying the ISO 37120 methodology again, it obtained the Gold seal. There is just one case of a city which, after applying the methodology had its certification level changed to a lower level, the city of Pune (India), which in 2016 was certified as Platinum and in the following year obtained the Gold certification.

As previously presented, 84% of certifications correspond to the Platinum and Gold level. Graph 6 shows the percentage in which the Gold Seal was obtained in the first certification, and when more certifications were needed until obtaining it.

Graph 6 - Obtaining the Gold Seal



Source: Prepared by the authors based on WCCD (2019).

This process took place with the city of Porto, in Portugal, which in the first certification obtained the Gold Seal, and in the following certification it achieved the Platinum classification. In this sense, Graph 7 shows the percentage in which the Platinum Seal was granted in the first certification, and when new certifications were necessary, after improvements and adjustments in the indicators of the cities, for the Platinum Seal to be granted.

Graph 7 - Obtaining the Platinum Seal

Source: Prepared by the authors based on WCCD (2019).

Based on the theoretical contribution about ISO 37120, it was possible to better understand its operation. The activity of analyzing data available on the WCCD platform was essential to understand the scope of this ISO and how it is being applied in the global context.

In addition, it was possible to observe that the use of the ISO 37120 model, despite having a global reach, is mainly restricted to European and North American cities, which have a high human development index, located in developed countries. Few certified cities are found in developing countries. One of the possible reasons that can contribute to this reality is the high fee charged for certification.

The financial issue arises prominently when the issue of renewal of certification is addressed, since many cities after acquiring the methodology of ISO 37120 fail to renew certification, due to high costs employed in this process. Another important topic that should be emphasized is that when reaching the highest level, the Platinum classification, many cities end up abandoning the certification renewal process, once they consider the investment high, or no longer see the need to apply such a methodology. In addition, these cities have often acquired knowledge of the processes and indicators that need to be measured and no longer need certification to attest to their quality,

which may make the control of these indicators part of the modus operandi in the management of the municipality.

Another point that makes the applicability of ISO 37120 difficult is that cities and local governments do not produce the same data, thus there is a differentiation in the collection, organization and availability of information, which makes standardization difficult. It is also emphasized that each city has its own characteristics, and that these must be considered when making decisions.

One of the most important characteristics that qualifies the certification of ISO 37120, is the question of comparison of registered cities. Information sharing and good practices make cities aware of initiatives that have helped other cities to become more sustainable and intelligent. It allows managers and governments to interact proactively, seeking the best for their cities and inhabitants through cases that have already been validated.

Another positive aspect that should be highlighted is that when certified by ISO 37120, the city has its data hosted on the WCCD platform. The publication in a portal with open data, brings greater transparency and knowledge of urban indicators of the studied city. At the same time, it brings managers and the community closer together, in addition to being an important attraction for investors looking to undertake in this location.

5 FINAL REMARKS

This article carried out an exploratory analysis of the ISO 37120 model - Sustainable Development of Communities: Indicators for Municipal Services and Quality of Life, until now little known and disseminated nationwide. In this analysis, the operation of certification was presented, as well as some weaknesses and potentialities of this certification system, which aims to assist in the solution of main urban issues, building smarter, more sustainable and resilient cities.

The analysis from collected data was of fundamental importance for understanding ISO 37120. Results that were expressed in graphics brought the applicability dimension of the methodology, as well as the scope that it presents. Knowledge of this system is important both as a theoretical contribution and for comparison with other models and rankings of indicators, encouraging discussion in the public, business and academic spheres.

From the results obtained, it was found that the number of cities seeking ISO 37120 seal has been growing, with 67 cities currently certified. Despite the global coverage, the certifications are concentrated on the European and North American continents. Another significant fact is that after their first certification, cities end up abandoning ISO 37120 system, often because they already have the knowledge of the applied methodology and end up using it informally.

Another important aspect to note is that many of the certified cities are government capitals of their countries, such as: Amsterdam, Bogota, Cape Town, Amman, Mexico City, London, Taipei, Tbilisi, and Warsaw. In this sense, it can be seen that certifications usually start in large centers and then spread to other areas.

It should also be noted that the applicability of ISO 37120 can be an important mechanism to help cities that use this methodology to become more intelligent cities, since the application of sustainability and sustainable development initiatives in all its dimensions is considered a premise for building more sustainable, intelligent and connected cities.

The study was designed to witness in practice the effectiveness of these indicators, as well as the applied initiatives that corroborated for cities to achieve a better classification. A more in-depth study is suggested, interrelating theory and practice, where it could be possible to analyze qualitative aspects of the indicators. As for the limitations found during the process of this research,

the main difficulty was having access to data from certified cities corresponding to each of the analyzed indicators.

The documentary research carried out in this work allows new research to compare other spheres of ISO 37120, which were not covered in this article. It is recommended as future research to carry out case studies in certified cities, in order to evaluate the initiatives carried out in practice to achieve certification. The comparison of ISO 37120 with other methods / systems / applications is also of significant importance and of great value for urban planning and management.

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1. Definition of research problem	√	√	√
2. Development of hypotheses or research questions (empirical studies)	√		√
3. Development of theoretical propositions (theoretical work)	√	√	
4. Theoretical foundation / Literature review	√		
5. Definition of methodological procedures	√	√	√
6. Data collection	√		
7. Statistical analysis	√		
8. Analysis and interpretation of data	√	√	√
9. Critical revision of the manuscript		√	√
10. Manuscript writing	√	√	√