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# TOP OF THE RANKING: EVALUATION METHODOLOGIES AND CLASSIFICATION INDICES FOR SMART CITIES

## NO TOPO DO RANKING: METODOLOGIAS DE AVALIAÇÃO E ÍNDICES DE CLASSIFICAÇÃO PARA CIDADES INTELIGENTES

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**ABSTRACT**

The research covers methodologies for applying intelligence indicators in cities. The overall objective was to analyze these methodologies and their main results based on reference events and awards in national and international scenarios. This is a documentary and bibliographic research, in which the approaches of ISO/ABNT standards and the application reports of indicators by the main entities dedicated to them prevail, such as Connected Smart Cities, in Brazil, and the IESE Cities in Motion Index, from the University of Navarra, among others. It was observed that there is a diversity of criteria per index and of results among the evaluating institutions, but the ISO/ABNT standards are prevalent or similar. Cities such as London and São Paulo stand out.

**Keywords:** smart cities; indicators; rankings; strategic planning.

**RESUMO**

A pesquisa abrange metodologias para aplicação de indicadores de inteligência em cidades. O objetivo geral foi analisar essas metodologias e seus principais resultados com base em eventos e premiações de referência em cenários nacionais e internacionais. Trata-se de uma pesquisa documental e bibliográfica, na qual predominam as abordagens das normas ISO/ABNT e os relatórios de aplicação de indicadores pelas principais entidades dedicadas a eles, como Connected Smart Cities, no Brasil, e o IESE Cities in Motion Index, da Universidade de Navarra, entre outros. Observou-se que há diversidade de critérios por índice e de resultados entre as instituições avaliadoras, mas as normas ISO/ABNT são predominantes ou similares. Cidades como Londres e São Paulo se destacam.

**Palavras-chave:** cidades inteligentes; indicadores; rankings; planejamento estratégico.

## 1. INTRODUCTION

This research presents a documentary and bibliographical approach to city evaluation methodologies in Brazil and worldwide, based on indicators of sustainability, intelligence, resilience, and compliance with environmental, social cohesion, and governance (ESG) standards or OCDE on Smart Cities and development, which, when integrated, form the classifications of Smart Cities. It includes an analysis of some of the main events and awards granted to compose the year-on-year comparative rankings, according to general and/or specific methodologies of the creators.

The classification of smart cities in Brazil and worldwide lacks uniformity, either because it focuses on the analysis of indicators established by the classification entity, or because the methodologies and concepts vary among the institutions that promote the indices, although authentic references are often used, such as the ISO Standards and their translations or adaptations for Brazil: NBRs ISO 37120/2021, 37122/2021, 37123/2021 and 37125/2025 (ABNT, 2021 a, b, c; 2025).

At the same time, the classifications (using sampling techniques), while quite useful, do not cover all cities, and among those that are included, many fall far short of the top rankings and may not receive sufficient analysis for use in public policy.

The research question, therefore, was the following: what indicators of technological, instrumental, and procedural intelligence in public systems and services are present, and how are they expressed in the main reports and awards granted, from the perspective of their

application in the context of strategic planning and the evolution towards smart cities?

The overall objective of the research was to analyze methodologies for applying indicators on smart cities and their main results based on benchmark events and awards in national and international scenarios, with the following developments: to present concepts of smart cities, to exemplify the most referenced indicators based on ISO/NBR standards, to compare the performance of the main cities highlighted in the annual rankings, and to analyze the political implications in the public sector.

The collection of intelligence indicators in cities is part of a global movement to classify and analyze investments in technology, sustainable development, resilience, public services, and quality of life. This movement has commercial and political purposes, but also research and development objectives, to identify limitations and opportunities in the local and regional context.

This research aligns perfectly with studies on public policies for regional development and the environment, including management models. Furthermore, it anticipates important experiences and results in identifying, articulating, and formulating proposals for the development and transfer of technologies to public bodies through research and development via entities such as the Federal Institute of Rondônia. It has a focus on partnership opportunities, fundraising, and the development of various projects to strengthen public policies for training, applied research, technological development, and outreach.

## 2. THEORETICAL BASIS: CONCEPT OF SMART CITIES

The reference concept that best guides this research is the one expressed in the Brazilian Charter for Smart Cities, presented by the Ministry of Regional Development, Ministry of Science, Technology and Innovations, Ministry of Communications and Giz Brasil (Brazil, 2020):

> *[Smart Cities] are cities committed to sustainable urban development and digital transformation, in their economic, environmental, and socio-cultural aspects, which act in a planned, innovative, inclusive, and networked manner, promote digital literacy, collaborative governance, and management, and use technologies to solve concrete problems, create opportunities, offer services efficiently, reduce inequalities, increase resilience and improve the quality of life of all people, ensuring the safe and responsible use of data and information and communication technologies. (p. 28).*

The verification of intelligence in cities involves, according to the Charter (Brasil, 2020), the degree of maturity or technological stage of the city, digital transformation, sustainability. In this context, aspects of humanization (education, health, security, social and cultural development), citizen participation, improvement of public services, resilience and technological aggregates are considered. Everything can be measured and converted into indicators of management, technology, processes, qualification and reach of services, with a view to preparing for contemporary demands, resilience, improving customer service, environmental and

economic sustainability, innovation, creating opportunities in scenarios that value culture, creativity, installed capacity and development opportunities. According to ABNT (2026), “[...] cities need indicators to measure their performance in order to be standardized, consistent and comparable with each other, seeking to ensure quality of life and sustainability in the implementation of policies, programs and projects that meet the needs of their inhabitants”.

Smart cities need to be, according to the Charter (Brasil, 2020), "diverse and fair", "alive and for people", "connected and innovative", "inclusive and welcoming", "safe, resilient and self-regenerating", "economically fertile", "environmentally responsible", "articulating different notions of time and space" (regarding local and regional development), "conscious, reflective and independent in the use of technologies" (without underestimating the available solutions), "attentive and responsible with their principles". These principles are integrated to make up the essence of the meaning of smart cities: they promote development in the present without compromising the development of future generations. They have technology as essential, but the human condition as indispensable. As about 85% of people live in cities, according to the Charter, the challenge in the urban environment is defined with density and diversity, according to the varied conditions of life, territory, culture and other socio-environmental and economic aspects.

According to Depiné and Teixeira (2021, p. 72-90), the concept of Smart Cities developed in three waves:

1. First Wave (1980s and 1990s): disjointed and diffuse focus, with convergence of new theories on urbanism policies and the

spread of ICTs, influenced by science fiction, which in turn was stimulated by inventions and discoveries since the Industrial Revolution, such as the electronic computer (a byproduct, according to the authors, of World War II).

2. Second Wave (2000s to mid-2010s): corporatist and technology-focused, guided by the interests of large companies, such as IBM, which also began to focus on software and consulting, and not only on hardware, but specialized publications included important themes, such as "political economy, science and technology studies, governability studies and ideological criticism, moving research away from the celebratory climate around smart cities" (p. 82).

3. Third Wave (current): humanized and focused on people, "driven by the needs and desires of citizens and communities", with a view to balancing the point of view of technologies in the face of the development of cities: "[...] technology represents a necessary but not sufficient condition for intelligent growth, and that, in order for it to act synergistically and generate development, the subjects present in the territory are essential [...]" (p. 90).

The intervals between these three waves demonstrate a fundamental perception for the use of the concept of Smart Cities, according to the history of Depiné and Teixeira (2021) combined with the results of the evaluation of indicators, as has been demonstrated here and will be explored later: there has been an evolution and diversification of equipment and systems disproportionate to the evolution of people and governments for the constitution of

intelligence in cities, in the full sense of promoting improvement in the quality of life. The same authors present seven criticisms in this scenario: uncritical view and absence of deep and objective evaluations; absence of dialogue and public debate on sensitive points; predominance of the private sector and market interests; attempt to standardize what is unequal by nature; use of the typology only as marketing; unforeseen negative consequences; low stakeholder engagement. Depiné and Teixeira (2021) state that there is low participation of citizens, often considered only as users and not producers of solutions, but it is also important to add the low adherence of governments to the initiatives that are developed in the reference cities.

A Brazilian Bill — PL 976 (Brasil, 2021) — is currently being processed in the National Congress, proposing to establish the National Smart Cities Policy, with the following concept, as set forth in Article 2:

> *I – smart city: urban space oriented towards investment in human and social capital, sustainable economic development and the use of available technologies to improve and interconnect the services and infrastructure of cities, in an inclusive, participatory, transparent and innovative way, with a focus on raising the quality of life and well-being of citizens.*

The concept corresponds to what has been exposed as the "third wave" of the history of evolution, and for this very reason requires a thorough analysis before, during and after the application of policies,

programs, projects and development plans, in order to prevent boastfulness and privilege practical effectiveness over what is expected: improvement of quality of life. Some government initiatives are discretionary and hierarchical, such as Decree 11,946, of March 12, 2024 (Brasil, 2024), which establishes: "Art. 1 The National Electronic Process Program - ProPEN is hereby established, with the objective of promoting the adoption of the electronic administrative process within the scope of the States, the Federal District and the Municipalities". Other legislation had already been instituted in the same area, such as Decree 8,539, of October 8, 2015 (Brasil, 2015), regarding the use of electronic means at the federal level, from which the creation of the Electronic Information System (SEI) would arise, for example, the Federal Regional Court of the 4th Region (TRF4). Another important regulation is Law 14,063, of September 23, 2020 (Brasil, 2020), which determines as follows:

> *Article 16. The information and communication systems developed exclusively by bodies and entities of the direct, autarchic and foundational administration of the Powers and constitutionally autonomous bodies of the federative entities are governed by an open-source license, allowing their use, copying, alteration and distribution without restrictions by all bodies and entities covered by this article.*

The Law ensures, therefore, that the solutions adopted by one city can be used by another at no cost or low expense, with a reduction in the time to solve the problems of service through public services.

Law 14.063/2020 is applicable to the principles of interoperability, integration, and cooperation that the Brazilian Charter for Smart Cities (Brasil, 2020) determines.

The conception of Smart Cities is linked or densely related to international protocols as well. The United Nations 2030 Agenda, launched in 2015, established 17 Sustainable Development Goals (SDGs) to be achieved by 2030, whose essence is the humanization of cities (and, therefore, intelligence). All SDGs are interconnected and aimed at improving the quality of life, as established by any concept of Smart City. Goal 11, Sustainable Cities and Communities, consists of "making cities and human settlements inclusive, safe, resilient and sustainable". It consists of seven goals of localized execution and three others of regional, national and/or transnational development. It is related to the other objectives, as is the case with each of them, from the perspective of overcoming problems and taking advantage of opportunities to promote a better, inclusive world, in which cities, with their people, processes and technologies, can be resilient and innovative. Goal 17 (Partnerships and Means of Implementation), aimed at "strengthening the means of implementation and revitalizing the global partnership for sustainable development", is the main articulator for the promotion of more humane, resilient and sustainable cities (as the essence of intelligence in cities), especially by goal 17.17: "Encourage and promote effective public, public-private and civil society partnerships, based on the experience of the resource mobilization strategies of these partnerships".

Technological and procedural solutions cannot be hidden or segregated in view of the principles of integration, dissemination of knowledge, sharing of resources, reduction of distance and

improvement of quality of life that govern the concept of smart cities. The improvement of the quality of life is integrated with the improvement of public services, because good service streamlines processes, minimizes efforts, reduces costs, and broadens the range of expectations. Cities that invest and orient themselves towards achieving the Sustainable Development Goals will certainly expand their intelligence indicators. As noted in the IESE Cities in Motion Index 2025 (p. 8),

> *Each city is a unique ecosystem, with its own opportunities and challenges. Therefore, any urban strategy must consider these particularities and establish clear, sustainable objectives that are adaptable to the changing demands of its inhabitants. In this sense, collaboration between governments, companies, academic institutions and citizens is essential. Building an interconnected urban fabric fosters knowledge sharing, increases transparency, and strengthens capacity to respond to future crises.*

The principle of cooperation is amalgamated with that of integration in approaches to the functioning and identification of intelligence in cities or smart cities; Another recurring aspect is the value that is provided to citizens by the services and products offered. According to the Connected Smart Cities Report (2025), "the evaluation of smart cities involves the analysis of various indicators that measure sustainable urban development and the quality of life provided to its inhabitants". The strategic use of infrastructures, services and

information and communication technologies characterizes these cities that stand out as spaces of connection and essential care, such as clean energy, waste treatment, sharing of products and spaces, accessible and efficient mobility, among other tangible and intangible goods for communities, in an inclusive way.

Smart Cities are then spaces that build capacities and apply solutions that promote sustainable development for all, in an accessible and articulated way, using digital technologies and services as instruments for qualifying public service services.

The Statute of the City, established through Law 10.257, of July 10, 2001 (Brasil, 2021), determines, in article 2, that "urban policy aims to order the full development of the social functions of the city and urban property, through the following general guidelines": right to sustainability, democratic management, cooperation between governments, balanced development, structuring, among others, regarding territorial planning and ordering. It provides that each municipality has a Master Plan (art. 4) and that its development, according to the Guide of the Ministry of Regional Development (MDR) (Brasil, 2022?), has as one of its strategies (E42) "to identify areas of interest and stimulate the development of productive activities linked to research and technology in a manner articulated with municipal urban and economic development" (p. 492).

Decree 9,854, of June 25, 2019 (Brasil, 2019), which "Establishes the National Plan for the Internet of Things and provides for the Chamber for Management and Monitoring of the Development of Machine-to-Machine Communication Systems and Internet of Things", defines six topics for the feasibility of the Plan, specified in article 5:

> *I - science, technology and innovation;*
> *II - international insertion;*
> *III - education and professional training;*
> *IV - connectivity and interoperability infrastructure;*
> *V - regulation, security and privacy; e*
> *VI - economic viability.*

Although **Technology** whether it is a much broader framework than the scope of IoT, the themes expressed there permeate any context of development directed to the institution or evolution of smart cities. There is or should be an interaction between all these themes in the construction of local documents for the establishment of Director Plans, including the Information and Communication Technology Director Plans.

Studies by Santos, Ribeiro, Lima, & Santos (2022) on bibliometric and patent prospecting of artificial intelligence technologies applicable to smart cities demonstrate the evolution of research and delivery of products with patent applications in this field:

> *In the set of patents researched, technologies were identified in several areas of knowledge, from the use of the neural network method for cognitive data analysis, the use of security products for intelligent monitoring, such as image processing for facial and signal recognition, to the use of intelligent monitoring for fire prevention scenarios. It was observed that the Artificial Intelligence approach started with the intention of encouraging Smart Cities in the physical infrastructure (through IoT) and is evolving to the management of the knowledge generated by the various nodes of the smart system network, demonstrating the need for automation and qualification in the generation, storage and inference on the mass of data, generating a great technical potential of solutions for Smart Cities that implement Artificial Intelligence.*

The design of smart cities carries a large number of already established themes (IoT, ICT, automation, digitalization) and others in emergence, such as artificial intelligence, cloud computing, 5G, sensing, new programming languages and the integration of technologies that can promote the facilitation of services, with efficiency and sustainability.

## 3. RESEARCH METHODOLOGY

This is a documentary and bibliographical research, with a prevalence of reports of results from events and awards established

by national and international entities in the promotion of smart city classifications. Thus, regarding its objectives, it is exploratory and descriptive, as it includes the analysis of various sources and their main characteristics; regarding procedures, it is more documentary than bibliographical, as it focuses on reference documents, such as ISO/ABNT standards and reports from entities dedicated to the application of sustainability, intelligence, resilience, and ESG indicators.

The method is deductive (because it focuses on the analysis of publications) and documentary in approach (because it prioritizes first-hand documents). The main sources of consultation are the references of indicators and methodologies for the application and classification of smart cities, in addition to the respective results reports. The analyses contained in the reports of the smart city classification entities are of data systematizations, which is why they open up a large margin for investigation, discussion, and analysis. According to Gil (2002, p. 45), documentary research can make use of materials “[...] that have not yet received analytical treatment or that can still be reworked according to the research objectives”. The classification of documents as “primary source” is a good distinction (Marconi & Lakatos, 2003), considering here those made available by the entities promoting events and awards in smart cities.

As, according to Franzin (2014), all research also has a bibliographic scope, its integration is spontaneous. Surveys of reference scientific articles were carried out in the Periodicals Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), but only for contextualization of studies of the same nature. Forty-nine articles emerged from the keywords "Smart City Indicators" within the period of 2015 to 2026. As the scope of the study is much more

documentary, only one publication was used here, selected for having a broader comparative approach and not focused on a case study.

The ISO/ABNT standards and reports from entities that have been promoting the application of smart city indicators and awards for at least 10 years were prioritized, but with a greater focus on the results of 2025, for an updated analysis centered on results arising from more consistent methodologies for defining and collecting indicators.

Some benchmark indices stand out in this research, such as the Connected Smart Cities Ranking (Necta, 2025) in Brazil, the Inova Cidade Award in Latin America (Smart City Business America, 2025), and the IESE Cities in Motion Index (University of Navarra, 2025), with a global approach, among others of equal or relevant similarity. However, the highest density corresponds to the benchmark indicators that ISO/ABNT proposes through its main standards for evaluating intelligence in cities, although the global context is one of liberality and diversity regarding application methodologies.

The approach shown here is not exhaustive, that is, it does not cover all initiatives for applying indicators, but rather exemplifies the main references, which can be used to induce the application of indicators by municipalities that are interested in using this study.

## 4. DISCUSSION OF RESULTS: METHODOLOGIES FOR IDENTIFYING INTELLIGENCE INDICATORS IN CITIES

Different methodologies can be created for the definition, survey and analysis of indicators from the perspective of smart cities, such

as what ABNT instructs and the experiences of entities that become dedicated to such verification.

### 4.1. The Abnt Methodology

The Brazilian Association of Technical Standards (ABNT) is a body recognized as of public utility through Law 4.150, of November 21, 1962 (Brasil, 1962), upon request and officialization of standards in the interest of the Government, including for the institution of seals or conformity marks. It was designated as the National Standardization Forum by the National Council of Metrology, Standardization and Industrial Quality, through Resolution 7, of August 24, 1992 (Conmetro, 1992). Thus, it became part of the Standardization System (Sinmetro), alongside, for example, Inmetro, which is the body responsible for supervising the standards regarding the criteria established by the Council. In addition, as she herself informs on her electronic portal (2026),

> *it is a founding member of the International Organization for Standardization (ISO), the Pan-American Commission on Technical Standards (Pan-American Commission on Technical Standards – Copant) and the Mercosur Association for Standardization (AMN). Since its foundation, it has also been a member of the International Electrotechnical Commission (IEC)*

ABNT initially issued three specific standards for the context and analysis of intelligence in cities. These are the Brazilian Standards

(NBRs) 37120, 37122 and 37123 (2021 a, b, c). In addition, it instituted NBR 37124 (2025), for instruction in the use of the other standards mentioned. According to NBR 37124 (ABNT, 2025),

> *cities need indicators to measure their performance in service delivery, monitor quality of life, and create policies for sustainable futures. Existing indicators at the local level are often not standardized, consistent, or comparable over time or across cities. This is due to different definitions and methodologies for what is measured.*

This is, therefore, a global view of the problem raised in this research regarding the lack of indicators or the use of indicators from the perspective of those who do the survey, in a context limited by the analysis based on adhesions and elective statements of the entities that perform the rankings of smart cities. However, the full lack of indicators is an even more serious problem than the existence of partial indicators or by extracts and clippings, as they at least create parameters from the point of view of excellence in public services. In other words, it is better to have limited or partial indicators than to have none.

ABNT's starting point for dealing with intelligence in cities was NBR ISO 37120 (2021), with a focus on sustainability, then it edited two others, to address complementary approaches to intelligence and resilience: "ABNT NBR ISO 37122 and ABNT NBR ISO 37123 were developed to support cities in their sustainability efforts, including

the fundamental guidelines of the smart and resilient city as essential for the holistic sustainability of the city" (2025, p. vi, sic).

NBRs/ISO are reference instruments to guide public policies, but they are not mandatory, unless Brazilian legislation establishes them. As stated in NBR ISO 37120 (ABNT, 2021, p. xviii), "conforming to this Standard does not confer a *Status* in this regard. A city adapted to this Standard, in relation to the measurement of indicators for urban services and quality of life, can only claim compliance in this sense". Therefore, applying the recommended indicators is a strategy and not a result, since the indicator is the starting point, but the "state" is the result of the actions towards reaching the reference values of the indicators.

ABNT encourages its indicators to be used in an integrated way, so that, according to it, compliance with NBR ISO 37122 (which deals with smart cities) includes "compliance with all the requirements established in ABNT NBR ISO 37120" (2021 a, p. xviii); the same guidance applies to NBR ISO 37123. NBR 37120 consists of "essential indicators", "support indicators" and "profile indicators", while NBRs 37122 and 37123 do not have this classification. They are described as follows by ABNT (2021 a):

> *a) Key indicators: indicators that are required to demonstrate the performance of urban service delivery and quality of life;*
>
> *b) Supporting indicators: indicators that are recommended to demonstrate the performance of urban service delivery and quality of life. These indicators can be selected according to the city's objectives;*
>
> *c) Profile indicators: Indicators that are recommended to provide basic statistics and context information to help cities perform peer-to-peer comparisons. Profile indicators are used as an informative reference.*

Given the relativity of the use of NBRs, which are not mandatory until they are instituted by law, the use of the indicators it presents is discretionary. In other words, the Municipalities can use these references as self-assessment instruments, under case study methods, comparative studies and others. After all, a great deal of preparation is needed by the city to achieve compliance, which starts with the availability of data and initiatives to promote intelligence and reaches the evaluation of results for the classifications or marking of reach levels. This requires specialties, which must be built continuously, with the use of internal and associated capacities (through hiring and agreements, for example).

The criteria for selecting indicators by ABNT involve a diversity of 19 thematic groups, such as education, health, economy, security and

governance, as well as energy, environment and others, as NBR 37124 (2025) presents. These themes result in 184 "key performance indicators" when combining the approaches of the indicators for sustainable cities and smart cities, which cannot be dissociated. According to ABNT (2025, p. 8), "[...] This data can be used to guide cities in the implementation of smart city solutions and projects and to monitor the progress and evaluation of such projects." However, the survey of indicators depends on records and databases, within a culture of data generation and management that still needs to be built in several municipalities in Brazil. Therefore, for research to be viable, researchers need to select what can be accessed within the time, resources, and permissions that are at their disposal.

The indicators are not effective by themselves, but depend on a methodical, contextualized manipulation, based on possibilities, objectives, and needs, as shown in NBR 37120 (ABNT, 2021 a, p. 5):

> *— indicators can be aggregated into larger administrative areas (e.g., region, metropolitan area, etc.);*
>
> *— since some indicators are indirectly related to sustainability, there is a need to consider the resource efficiency of a city;*
>
> *— indicators can be grouped for analysis according to the holistic characteristics of a city; e*
>
> *— This set of indicators can be complemented by other sets of indicators in order to obtain a more comprehensive and holistic approach to sustainability analysis.*

Considering that the number of indicators is high, data management in Brazilian municipalities can be low and the interests can be very diverse, the use of the rules must be treated under the principle of permissiveness and not the obligation not legally instituted, in order to have an appropriation to the extent of the effectiveness of the evaluator or researcher. However, the importance of indicators, especially essential ones, such as per capita income, unemployment rate, number of companies, digital technological applications, implemented systems, online services, among others, in the context of smart cities, is not denied. It is important that the indicator, if applied, is clearly defined, at the creation or at the source of origin, so that it reveals exactly the data

that is sought, with the value that is peculiar to it, without manipulation.

There is a recurring guideline in the three ABNT reference NBRs (37120, 37122 and 37123, 2021): public management must be oriented to provide a better quality of life, as a result, in large part, of excellence in public services. One of the purposes of NBR 37122 (ABNT, 2021) is precisely to offer guidance so that municipal initiatives "[...] provide a better living environment, in which intelligent policies, practices and technologies are put at the service of citizens" (p. xvi). It advises that the indicators be surveyed annually, with the appropriate relativity to each location: "Depending on their intelligence objectives, cities will choose the appropriate set of indicators from this Document to be reported" (p. 3). It also warns that there will be no uniformity in the use of the standard: "The local institutional environment may affect the ability to apply indicators." Contextual analysis is important both to define indicators and to interpret the data and values that constitute them. It is also necessary to consider the joint responsibilities of the governments of the three spheres in the analysis of results. This means that the criteria for choosing indicators and evaluating the data they aggregate are very important for a definition of field findings. These are the criteria that ABNT (2021 b, p. 3) recommends by NBR 37122:

> *— Comprehensiveness: indicators should measure and balance all aspects relevant to the evaluation of a smart city.*
>
> *— Neutral technology: not favoring one technology over another, existing or future.*
>
> *— Simplicity: indicators can be expressed and presented in an understandable and clear way.*
>
> *— Validity: Indicators are an accurate reflection of the facts and data that can be collected using scientific techniques.*
>
> *— Verifiability: the indicators are verifiable and reproducible. The methodologies are sufficiently rigorous to give certainty as to the level of implementation of the criteria.*
>
> *— Availability: Quality data is available, or it is feasible to initiate a secure and reliable monitoring process to be made available in the future.*

As availability can affect comprehensiveness, it is understood that the criteria can be selected, as long as they are applied uniformly when there is a comparison between cities or are simply based on a self-assessment in each municipality. It is very common to observe the scarcity of data in City Halls, when accessing their institutional portals. The use of indicators, therefore, must be appropriate to the

interests and needs of those who apply them, as ABNT advises (2021, p. 3).

> *Users can also consider the following aspects, which must be clearly stated in the report and justified: indicators can be aggregated to larger administrative areas (e.g., region, metropolitan area); indicators can be grouped for analysis, taking into account the holistic characteristics of a city; And this set of indicators can be complemented by other sets of indicators in order to provide a more comprehensive holistic approach to the analysis of smart and sustainable cities.*

Therefore, the researcher has the NBRs as references of the first magnitude, but not exhaustive or as absolutist determinants. In fact, the Federal Government surveys indicators, through the Intelligent Platform of the Ministry of Science, Technology and Innovation (MCTI), the Transparent Brazil Scale of the Office of the Comptroller General of the Union and Gov360 of the Ministry of Management and Innovation in Public Services, for example. In general, what is expected, according to ABNT (2021 b, p. 4), is that "[...] the data must be verifiable, auditable, reliable and justified", although the indicators and sources may be different from those indicated.

In the evolution of the concept of smart cities, the concept of sustainability, intelligence and resilience is integrative, so that, when it comes to "smart cities", one cannot lose sight of programs, projects, policies and mechanisms to promote sustainability as a

condition of intelligence, resilience as a mechanism of sustainability and all this together to result in the promotion of local and regional development and improvement of the quality of life.

The 19 areas that ABNT covers, in the set of its three initial ordering norms of indicators, can be aggregated among themselves, as the entity itself admits, according to local interests and conditions. It is observed that areas such as Economy and Finance are very close, as well as between Environment and Climatic Conditions, Sewage and Water; at the same time, Water, Sewage and Solid Waste could be integrated into Basic Sanitation as a large area, which in turn is linked to Urban Planning. There are different ways of seeing and organizing indicators, which can be selected or added to others, providing dynamism and flexibility for their use.

ABNT recommends that at least 50% of the indicators proposed by NBR 37122 be used and that NBR 37120 also be applied (2021 a; 2021 b), precisely because smart cities are not dissociated from sustainable cities or resilient cities, so that the separation is, perhaps, didactic, as to smart city indicators with a more specific focus on technologies, entrepreneurship and innovation. This can be clearly seen when analyzing NBR 37124 (ABNT, 2025), which instructs the use of the other three, including a table of ordering all indicators side by side by concept and reference area.

Just as an example, an indicator such as "5.2 Survival rate of new businesses per 100,000 inhabitants", in the area of economics, demonstrates a concern with business sustainability, but, within the concept of smart cities, it is more related to consistency entrepreneurship; the indicator "6.3 Number of graduates in higher education in the areas of Science, Technology, Engineering and

Mathematics (STEM) per 100,000 inhabitants" (education area) is directed to professional qualification and not only to schooling; in "10.2 Percentage of accessible urban services that can be requested online" (governance), the focus is on information and communication technologies at the service of society, while "10.1 Frequency of updating disaster management plans" corresponds to resilience, but which can also be made possible through ICTs, including IoT; the indicator "11.1 Percentage of the city's population with unified electronic medical records, accessible online by health service providers", in addition to conceiving digital technologies, also reveals the importance of accessibility and information security (by preventing loss and diffuse distribution of data); and, finally, among many other examples, the indicator "15.1 Percentage of the city area covered by digital surveillance cameras" is an even greater consolidation of the trend of using digital technologies to improve public services, especially essential ones.

For some areas, ABNT (2021 b) presented few smart city indicators, but it does not mean that they cannot be created. For example, there is a lack of indicator on the existence of computerization systems (in health, education, security) that allow the full management of services; At the same time, there are a large number of indicators corresponding to instrumentation in general. Therefore, the use of NBRs will depend on selection criteria, data availability, and data collection and treatment specialties. The best perspective of ABNT, however, is to use the reference NBRs as fully as possible.

ABNT also edited NBR 37125 (2024), with an approach to Environmental, Social and Governance Indicators — *Environmental, Social and Governance* (ESG), in the scope of sustainable cities and

communities. According to Sebrae (2026), ESG "[...] It is an acronym that refers to the integration of the generation of economic value combined with the concern with environmental, social and corporate governance issues on the part of companies", but which also applies to public services, due to the nature of the areas covered. The materiality assessment is very important in this approach, regarding the existence of the evaluation markers.

NBR ISO 37125 presents 133 indicators, distributed in areas such as sanitation, mobility (environmental), education, health (social), finance, urban planning and strategic planning (governance). Issues such as CO emissions$_2$ *per capita*, percentage of recycled waste, schooling rate, crime rate, response time of public services, among others, constitute the indicators, revealing cross-cutting and complementary items in relation to other standards, as NBR 37125 itself informs: "Although KPIs (252 in total plus a set of profile indicators) exist in ISO 37120, ISO 37122 and ISO 37123 for cities that can support ESG measurements in cities, there are also gaps within these indicators" (ISO, 2026). NBR 37125 distributes 41 environmental, 40 social, 32 governance and 20 cross-cutting indicators in the three dimensions. Among the transversal ones, are typical of smart cities, for example, those of digital inclusion, public governance, strategic planning. These indicators result from a specific distribution methodology and not from mirroring as in the relationship between NBRs 37120, 37122 and 37123.

In any case, it is important to consider the alignment of the indicators with the SDGs of the 2030 Agenda, signed by the member states of the United Nations, since they permeate any proposal for smart cities.

ABNT is a Certifier of smart cities, through "[...] an indicator certification process based on the ABNT NBR ISO 37120, ABNT NBR ISO 37122 and ABNT NBR ISO 37123 standards, whose main objective is to help cities attract investments and boost economic development with global comparative data" (2026). Its certification takes place in four levels, as shown in Figure 1.

**Figure 1 — Certification Levels of Smart Cities by ABNT**


Source: ABNT (2026)

ABNT also makes ESG certifications, according to the list of certified cities that it presents on the same portal, including São José dos Campos/SP and Pindamonhangaba/SP, with certification in the four NBRs; São Paulo/SP and Salvador/BA, in NBRs 37120, 37122 and 37123; and Recife at 37120, all valid until the second half or end of 2026. São José dos Campos, according to the announcement of its City Hall (2026), was the first city in the world to receive ISO 37125 (ESG) certification, with the following highlights that it indicates: environmental education in schools, international certification in the management of tree heritage, excellence in selective and common collection services, SFX primate preservation program (from the São Francisco Xavier region), solid waste management, real-time air

quality monitoring, implementation of urban gardens, spring revitalization program, cycling network per 100,000 inhabitants.

### 4.2. Indicator System For Ranking Smart Cities

The ranking of smart cities in Brazil and in the world has as one of its components a representation that can be carried by political and commercial factors, but with a strong cultural component as well, regarding the conception of modernization of cities. Among so many possible examples, the Connected Smart Cities, the Smart Cities Expo World, the Cities in Motion Index and the Smart City Index will be discussed below.

#### 4.2.1. Connected Smart Cities

Connected Smart Cities is an initiative of Necta, created in 2011 to evaluate and classify cities in an event promotion system and national ranking from 2015, with data also organized by region, as shown on its electronic portal (2026). Its methodology, expressed in the Ranking Connected Smart Cities Report (2025, p. 5), is “based on the SDSN - Sustainable Development Solutions Network, integrating the indicators of the ABNT ISO 37120, 37122, 37123 and 37125 Standards, SDG indicators - Sustainable Development Goals and indicators from various studies”.

Also according to the Report (Necta, 2025), the SDSN was created in 2012 by former UN Secretary-General Ban Ki-Moon and economist and professor Jeffrey Sachs, as a strategy that "[...] mobilizes the global knowledge community for science-based solutions for sustainable development" and is currently guided by the UN "[...] to promote integrated approaches to implementing the SDGs and the

Paris Agreement through education, research, policy analysis and global cooperation" (p. 5-6).

The studies that Necta carries out are consolidated with the Report of the reference year and with a dissemination event, open to the presentation of solutions from the City Halls, lectures and other activities, typical of events of this nature.

The scope of the Connected Smart Cities 2025 edition includes the 5,575 Brazilian municipalities, 13 thematic axes, a score delimited from 0 to 100 and the application of 75 indicators, selected from the following sources: NBR 37120 (31 indicators), NBR 37122 (13), NBR 37123 (13), ISO 37125 (2), CSC Ranking 2014–2024 (10), Caixa Gestão Sustentável Seal (3), Others (3). It is observed, therefore, that the classification of smart cities can be based on several references, but certain standards can prevail — with 59 indicators (78.7%) of origin of global application ISO/ABNT, in this case. The criteria observed were territorial coverage (all Brazilian municipalities), statistical adequacy according to valid and reliable measures, timeliness and quality of the data (measured according to the security of the source). The thematic axes used were: Economy and Finance; Governance; Innovation and Entrepreneurship; Telecommunications; Education; Health, Local/Urban Agriculture and Food Security; Environment and Climate Change; Solid Waste, Sewage and Water; Energy; Housing and Urban Planning; Security; Urban Mobility; Population, Social Conditions.

The highest concentration of indicators was in the Economy and Finance axes; Education; Solid Waste, Sewage and Water; and Health, Local/Urban Agriculture and Food Security. The Connected Smart Cities Ranking ratifies an important observation in this

context of studies and evaluations on smart cities: "It is important to inform, however, that some municipalities presented a lack of data for some indicators. In these cases, the data were considered absent and, therefore, not available, and in the statistical treatment of the methodology, they were considered empty" (p. 12).

According to the Necta Report (2025), the Connected Smart Cities methodology and the construction of the 2025 Ranking was guided by the principles of the wide and accessible dissemination of results that it achieved, by the inclusion of indicators based on the evolution of evidence and by the metric focused on the absolute performance of cities, and not in a comparative way with other cities, although there is a classification as a demonstrative result of performance.

The Connected Smart Cities Ranking is an independent and voluntary classification, unlike the ABNT Certification, which is contracted by the municipality itself. In addition, it searches for data in a more diverse way, assigns value to the data and establishes the ranking. However, the Report indicates that "[...] municipalities should not claim that the position in the ranking or certification [in the case of ABNT] gives them the status of 'smart city', 'resilient city', 'sustainable city', among other variations" (2025, p. 17), since the result is based on the data made available and not on the "full state" of the municipalities, but it seems inevitable not to use the classification as a form of political marketing and demonstration of better levels of reach in a comparative way, since the classification in these rankings reveals at least that there was a better performance of some municipalities in relation to others.

Everything indicates that municipalities should be concerned with making as much data as possible available, so that their efforts do

not go unnoticed and can better "compete" in these classifications, even if involuntarily. It should be noted, however, that the non-availability of data may be an accidental administrative failure or resulting from a lack of preparation for results management. This can lead, in terms of legal obligation, to non-compliance with the principles of transparency more broadly; It can also generate losses for public policies, given that data are inputs for strategic planning. The CSC 2025 Ranking even reveals that the final average score of the first place city was 61.3 points out of 100 and that only 2% of the others reached more than 50 points. The best results were from the following cities: Vitória/ES, Florianópolis/SC, Niterói/RJ, São Paulo/SP, Curitiba/PR, Recife/PE, Barueri/SP, Santos/SP, Salvador/BA/ Rio de Janeiro/RJ.

The specific results by state can be found on the Scipopulis page, Mysmartcity, at https://ranking.mysmartcity.scipopulis.com/.

As the CSC 2025 Ranking is based on selected indicators, and thus on all other ranking systems, the results must be viewed with relativity, because some investments may not show through, while others are prestigious. The city best ranked nationally in the CSC 2025 Ranking, Vitória/ES (61.27 points), achieved the best results in Telecommunication, Governance, Solid Waste, Sewage and Water, Education and Security, while the least expressive result was in the Environment and Climate Change axis. In general, critical issues related to the environment are recurrent.

#### 4.2.2. Smart City Expo World Congress

The Smart City Expo World Congress (SCEWC) takes place annually in Barcelona, Spain (at Fira Barcelona), in a large pavilion where

global leaders from the public, governmental and non-governmental areas are gathered, with exhibitions of products, systems, case studies, lectures, thematic panels and other congress experiences. Its organizers also elect the cities they consider the smartest in the world, with various awards.

In 2025, 138 countries participated, with 997 cities. The finalists in the City Award were: Rome/Italy, Yangzhou/China and Santiago de Cali/Colombia. There were also other awards: in Innovation (with highlights for Sri Lanka, South Africa, the United States); Enabling Technologies (Saudi Arabia, Luxembourg, Japan, United Kingdom); Energy and Environment (France, China, Kenya, Saudi Arabia); Mobility (Italy, Spain, Canada, Korea, Egypt); Infrastructure and Construction (Germany, Singapore, Saudi Arabia, Brazil); Governance and Economy (Argentina, Ukraine, Belgium, Saudi Arabia); Life and Inclusion (Brazil, Turkey, Mexico, United Kingdom).

The finalist cities of the City Award addressed the following elements or concepts in their presentation, exemplified below only for the purpose of verifying the context of the awards in smart cities, as stated in the SCEWC portal (2026):

a. Rome, Italy: leveraging data, 5G, digital twins, urban governance, improving public services, sustainability, resilience;

b. Yangzhou, China: Industrial upgrades through digital tools, urban governance, ecological monitoring, AI-driven tourism;

c. Santiago de Cali, Colombia: urban planning, social transformation, environmental restoration.

Brazil was a finalist in the Infrastructure and Construction Award modality through the Morar Melhor Project, of the City of Salvador, Bahia, whose action includes structural repairs of the homes of low-income families, as stated in the electronic portal of the Secretariat of Infrastructure and Public Works (Bahia, 2026); in the Life and Inclusion Award category, it was a finalist for São Paulo through the Resilient House in Favelas Project by Teto Brasil, for the collaborative construction of residences in vulnerable settlements, designed with the communities, as stated on the SCEWC portal (2026); in 2023, Curitiba/PR was ranked as the smartest city in the world, according to the website of its City Hall (Curitiba, 2024).

One aspect of this event is held in several countries, including Brazil, called Smart City Expo Curitiba, which is already in its 7th edition in 2026, including the Brazilian Awards (3rd edition), won by the City Hall of Santana de Parnaíba, São Paulo, in the Smart City modality, with the Central Municipal Indicators Project: Data Intelligence, Performance Management and Smart City; in the Innovation and Digital Transformation modality, Joaçaba City Hall, Santa Catarina; in Social Equity, Santo André, São Paulo; in Urban Mobility, Nova Lima, Minas Gerais; in Sustainable City, Niterói, Rio de Janeiro. These rankings vary from year to year. In 2025, Smart City Expo Curitiba ranked São Gonçalo do Abaeté, Minas Gerais, as the smartest.

#### 4.2.3. Cities In Motion Index

The Centre for Globalisation and Strategy and the Department of Strategy of the IESE Business School, linked to the University of Navarra, Spain, has a platform that manages the IESE Cities in Motion Index (ICIM). According to the report of this index (2025), the platform fosters a city model (Cities in Motion) based on sustainable

ecosystem, innovative activities, equity among citizens and connected territory. It applies a methodology for surveying indicators globally, with an approach in nine dimensions: economy, mobility and transport, technology, environment, international projection, urban planning, human capital, social cohesion and governance. The 2025 result corresponds to the 10th edition and includes the analysis of 113 indicators in 183 cities (85 capitals among them) in 92 countries. The methodology is based on the analysis of indicators, contexts and field surveys by interviews, as follows:

> *Our platform presents a theoretical framework based on the analysis of numerous success stories and in-depth interviews with urban leaders, entrepreneurs, academics and experts in city development. This framework proposes a series of stages that include the analysis of the context, the formulation of a strategy and its subsequent implementation. In this sense, an effective analysis begins by understanding the current situation of each of the key dimensions (see **Figure 2**), which are described below, together with the indicators that make up the calculation of the **ICIM.** (2025, p. 10).*

They understand that education, culture and innovation are fundamental pillars of city evaluation, so that technological aggregation is not enough as a valuation alone. Just to exemplify, indicators such as spending on education (human capital), women's safety (social cohesion), time required to start a business (economy), open data platform (governance), climate vulnerability

(environment), traffic inefficiency index (mobility and transport), access to public transport (urban planning), number of hotels per capita (international projection), culture of innovation (technology) are used. There are also unconventional data, such as "numbers of McDonald's establishments per city", in the area of international projection, but also a standardized approach, based on the indication of ISO 37120 as a reference for prominence in governance (p. 14):

> *Cities certified under ISO 37120 demonstrate a tangible commitment to improving services and quality of life. This standard establishes a framework of 100 indicators that allow cities to be evaluated and compared in an equitable way, favoring the transition to smarter and more sustainable models. This indicator is considered positive within the ICIM analysis.*

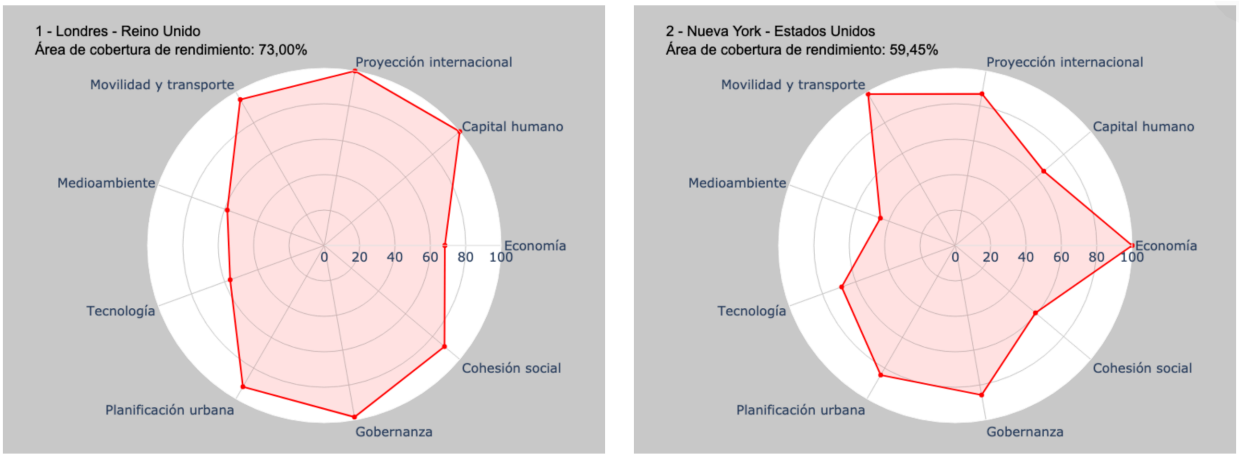
The classifications of this index are not complete, because they do not cover all cities or even all capitals. From Brazil, for example, Belo Horizonte, Brasília, Curitiba, Rio de Janeiro, Salvador and São Paulo are referenced, but not Vitória and Florianópolis, for example, which have been standing out in the Connected Smart Cities Ranking, among other recognitions. The best results were achieved as follows: London/United Kingdom (index of 100 points), New York/USA (96.52), Paris/France (83.40), Tokyo/Japan (80.54), Berlin/Germany (73.05), Washington/United States (72.55), Copenhagen/Denmark (70.25), Oslo/Norway (69.84), Singapore/Singapore (69.72), San Francisco/USA (69.12).

The Brazilian cities were classified as follows: São Paulo (127th), Rio de Janeiro (134th), Curitiba (148th), Brasília (153rd), Belo Horizonte (157th), Salvador (161st), all with a low index (B), less than 45 points, as well as 70 other cities (38.25% of the total). The best ranked Brazilian team was behind Santiago/Chile, Buenos Aires/Argentina, Mexico City/Mexico and Montevideo/Uruguay. On a larger spectrum, the index shows better results for European and North American cities and worse for Latin American, African and Middle Eastern cities, but there is a highlight for China in mobility and transportation, with the first places for the cities of Beijing (1st), Shanghai (2nd), Shenzhen (6th) and Guangzhou (9th), and in technology, with emphasis on Hong Kong (1st).

It is observed, therefore, that there is a disparity between these rankings, since Smart City Expo World ranked Curitiba in 1st place in 2023, but in 2025 this same city appears in Cities In Motion in position 148th. The reason for this is due not only to the performance by indicators, but also to the selection of indicators, varied measurement criteria and methodological strategies that are not uniform in the world. However, more important than performance is the presence of cities as a reference for evaluation of the various indicators eligible for analysis of intelligence indicators. The reports allow important analysis of contexts, scenarios, investments and even the lack of availability of open data for consultation and use in the evaluation.

Figure 2 allows a comparison of results in terms of performance by area, by way of example, for a better understanding of the results and, consequently, the apprehension of the methodological criteria.

**Figure 2 — Demonstration by comparison of the best results of Cities in Motion 2025**




Fonte: Cities in Motion Index (2025)

The analysis of the variables is very important, because while London has the greatest reach in international projection, human capital and governance, New York, in second place, stands out more in economy and mobility and transportation. If the "human capital" axis is one of the main ones in the conception of smart cities, its full scope helps to endorse the classification of cities that privilege it.

### 4.2.4. IMD Smart City Index

The IMD Smart City Index is produced by the Smart City Observatory, which is part of the IMD World Competitiveness Center, as stated in its 2025 results report. IMD stands for International Institute for Management Development — an independent business school located in Lausanne, Switzerland. Its methodology involves:

1. Evaluation based on residents' perception of technological structures.

2. Capturing perceptions from 120 residents in 148 cities around the world, with scores based on the last three years of the

survey (2023–2025).

3. Organization of the research with two pillars: Structures (infrastructure of cities) and Technology (technological services to serve the inhabitants).

4. valuation focused on five areas per pillar of approach: health and safety, mobility, activities, opportunities and governance.

5. Distribution of cities into four groups according to the Subnational Human Development Index (SHDI) score of the country covered in the survey.

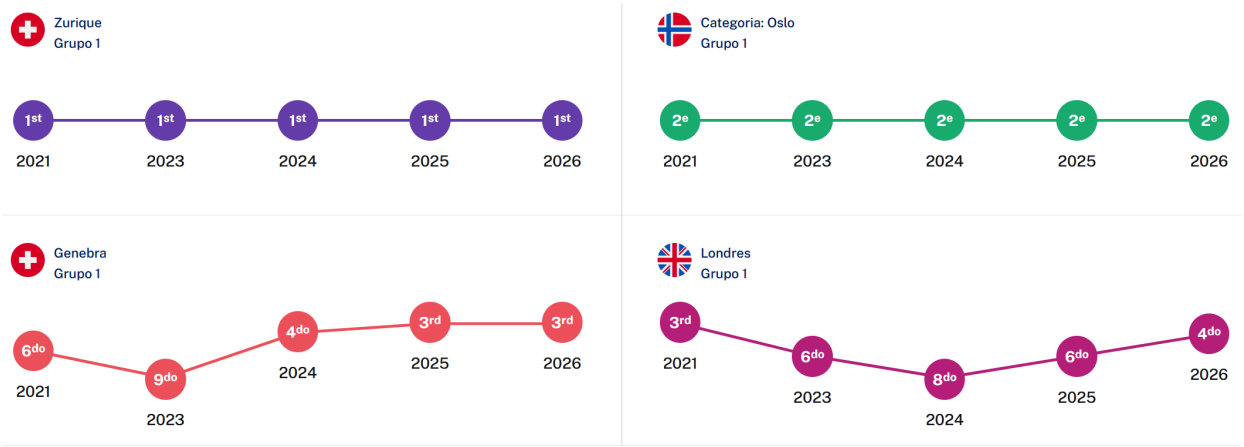
6. Classification of each city in scales by HDI group, based on the scores resulting from what the residents indicated, compared to the results of other cities.

7. Classification in an overall ranking and in a ranking by pillar of approach.

The top ten results were achieved by the following cities: Zurich, Oslo, Geneva, Dubai, Abu Dhabi, London, Copenhagen, Canberra, Singapore and Lausanne. Of these, 5 are capitals: Oslo (Norway), Abu Dhabi (United Arab Emirates), London (England), Copenhagen (Denmark) and Canberra (Australia); there is also a city-state (Singapore). These top-ranked cities fluctuated little in their positions, but Paris, for example, fell from 49th to 71st position, and Los Angeles, from 68th to 91st. Among the cities in Brazil, Brasília remained stable in 130th position, São Paulo fell from 132nd to 137th position and Rio de Janeiro oscillated from 139th to 146th (last position in the group). In Latin America, Chile surpassed Brazil, with Santiago ranked 120th; Buenos Aires was only one position behind

Brasilia. Figure 3 shows the outline of a historical series of results, considering the best classifications, in a comparative and exemplifying way:

**Figure 3 — IMD Index results**




Source: IMD (2026)

Some cities are more stable in the ranking, such as Zurich (Germany) and Oslo (Norway), while others, such as Geneva (Switzerland) and London (England), fluctuate in their positions. It is noted that London again stands out, ranking 6th in this IMD index (2025), although it ranked 1st in Cities in Motion (2025); in IMD, it had a drop from 3rd place in 2021 to 8th place in 2024, but evolved to 6th in 2025. This oscillation can be due to the development dynamics of cities in the world, criteria adopted in the evaluations, uncontrollable perceptions of residents and all these factors at the same time. Likewise, there are variables of criteria and methodologies among researchers, so that the results are merely an index, but still of great use for evaluations and strategic planning.

Among the indicators applied by the IMD, the following can be exemplified: "Sanitation meets the needs of the poorest areas" (Health and Safety), "Online scheduling and ticket sales have made public transport easy to use" (Mobility), "Most children have access to

a good school" (Opportunities – Work and School), "Green spaces are satisfactory" (Activities), "Processing ID documents online has reduced wait times" (Governance). One of the main concerns, according to the IMD Report (2025), is with affordable housing, according to the responses of 75.5% of the participating public. With population growth in some centers and the concentration of real estate ownership, social inclusion through housing has long become a major challenge.

#### 4.2.5. Other References

There are several initiatives to apply smart city indicators, generate rankings and awards of a global or localized order. Other examples are discussed below.

O **Smart Community Awards** The Intelligent Community Forum (ICF) is another approach to smart cities, based on the identification of practices to promote the concepts and principles of intelligence in cities. It selects 21 communities that best express results related to technologies, economic growth, connectivity and other areas of interest for the evolution and improvement of living conditions. Among the 21 communities that encompass Smart 21, they select 7 for awards, every year. The regions classified in 2025 were: Assaí, Paraná, Brazil; Hilliard, Ohio, USA; Bursa Metropolitan Municipality, Turkey; Kingston, Ontario, Canada; Durham Region, Ontario, Canada; Las Rozas de Madrid, Spain; Fairfield/Jefferson County, Iowa, USA. By the way, Curitiba was the headquarters of the 2026 Smart 21.

It is also representative of the **Seoul Smart City Prize** (Seoul Smart City Award), promoted by the Government of Seoul and oriented towards inclusion and social innovation of municipal governments

or individual, corporate and institutional efforts, "[...] to ensure an inclusive digitalisation of public services that benefit all people in sectors such as mobility, security, wellbeing, environment, energy, culture and governance" (2026). The evaluation criteria involve "Problem-Centered Evaluation", "Rational Project Development Process", "Feasible Budget and Planning", "Meticulous Project Implementation", "Effort to Learn and Improve", "Value Creation". Curitiba won the "People-Centered City Silver category of the Seoul Smart City Prize 2024 (South Korea), with the case Curitiba Smart and Sustainable City", according to the local City Hall (2026).

O **World Government Summit** — World Government Summit is a non-profit organization created by the Government of Dubai (United Arab Emirates) in 2013 as an international collaboration strategy to inspire and empower new generations of governments. It includes some awards, such as GovTech, "granted to creative and innovative solutions that address urgent challenges and create exceptional government service experiences", won by Brazil in 2025 in the Best People-Centered Government Service category, through the Citizen Service Program (Balcão Gov.Br) (2026).

Centered on Latin America, there is the **Inova Cidade Award**, of the Smart City Business Institute, present in nine countries and which presents itself as follows: "[...] we foster real connections and a dynamic environment to make cities more efficient, accessible, and humane" (2026). The Award, for more than a decade, "[...] recognizes initiatives, actions, leaderships, and trajectories capable of generating a positive, sustainable, and measurable impact on the quality of urban life" (2026). It is organized into two categories, one general and the other authored or led by women, always focusing

on innovation and entrepreneurship. The City Hall of Assaí/PR was one of the winners.

The Organisation for Economic Co-operation and Development (OECD) launched the Smart Cities and Inclusive Growth Programme in July 2019 “[...] to assess and measure the performance of smart cities and how they contribute to inclusive growth and well-being” (2026). It focuses on the use of technologies for urban development, from a perspective of sustainability, competitiveness, and social inclusion. It covers areas such as mobility, housing, environment, planning, public safety, citizen engagement, and others. This engagement reinforces the global trend of paying attention to and investing in achieving smart city indicators.

Many researchers are discussing concepts and methodologies for surveying smart city indicators. On the Capes Journal Portal, for example, 49 articles were found based on the keywords "Smart Cities Indicators", within the period from 2015 to 2026. In general, researchers focus their discussions on case studies of smart cities and/or on comparison of methodologies and results, as has also been demonstrated in our approach. Flores and Teixeira (2017), for example, when comparing the rankings of the Arcadis Sustainable Cities Index — Arcadis Smart Cities Index, in Amsterdam, Netherlands, and the European Smart Cities, of the Technical University of Vienna, Austria, concluded that "from the data described about each of the rankings presented by this work, it could be seen that both present convergences of information regarding their indicators" (p. 75), But each award with a more focused centralization, whether in environmental health or in coexistence, economy and technology, respectively.

## 5. FINAL CONSIDERATIONS

This study demonstrated the methodologies for selecting and applying indicators for intelligence assessment in cities around the world, based on highly representative entities and reports, such as the Connected Smart Cities Ranking (2025), in Brazil, and the Inova Cidade Award from the Smart City Business Institute, in Latin America; with international coverage, the Smart Cities Expo World, in Barcelona; the IESE Cities in Motion Index, from the University of Navarra; and the IMD Smart City Index, from the World Competitiveness Center, among others. The rankings are very disparate between the indexes, but the disparity does not cancel out the comparative usefulness of the results of the indicator surveys for a perception of development. Although they can be used for political purposes, for self-promotion, the results allow us to specialize this perception.

Smart cities are those that invest in technologies and services capable of promoting the improvement of the quality of life and economic development according to principles of social inclusion, with sustainability and wide use of information and communication technologies. ISO/ABNT Standards are essential references for the definition and application of sustainability, intelligence, resilience, and ESG adequacy indicators, but it is not enough to just apply indicators; Monitoring and availability of data is necessary for greater recognition and citizen participation in the evaluations of programs, projects and results. In fact, City Halls focused on improving their national and international projection can apply for the seal of compliance with ABNT standards. The use of indicators as factors for the pursuit of results is important in the strategic planning of governments, because they direct actions to achieve results that are

important not only for awards, but primarily to make cities more humane, sustainable and resilient, that is, smarter.

The indicators raised in ranking processes are not resolute, but rather a thermometer of identification and a reference to mirror how cities are organized and developed from the perspective of good practices of strategic planning and development of alternatives for the best possible overcoming of challenges. Information and communication technologies are decisively imposed in the changes in procedures for the provision of services and for local and regional development. Digital technologies tend to optimize processes, reduce operational burdens, prevent errors, improve procedures, reduce distances and social inequalities, promote inclusion (economic, social, cultural) and integrate people, systems and entities.

As the intention in this study is not to exhaust cases, but to identify and analyze survey methodologies, it is considered that the examples given enable a discussion on the definition/selection and application of indicators in a broader or more localized scenario.

If sustainable development is a premise of smart cities, then there is a need for adjustment, either by promoting investments to achieve better indices in the indicators, or by a better combination of data for a possible homogeneity of this real disparity between results. The references for the application of indicators are very useful for municipalities or regions that, in the vast majority of cases, are not included in the most ostensive surveys, since the evaluations are made by extract and not in a more comprehensive or universal way, except in the surveys of indicators nationally, as is the case with Connected Smart Cities, which exhausts the 5,570 Brazilian cities.

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