



Ideal City and Real City: A reflection on sustainable cities

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SUMMARY

According to UN data, the proportion of people living in urban areas has increased from 30% in 1950 to 55% in 2018. This population growth, especially in poorer countries, presents significant challenges for promoting sustainable urban development. Issues such as socio-spatial segregation, inadequate infrastructure, lack of basic sanitation, pollution and aggravated displacement are some of the challenges faced by cities. The UN's 2030 Agenda, with its Sustainable Development Goal (SDG) 11 - "Sustainable Cities and Communities," highlights the importance of making cities inclusive, safe, resilient and sustainable. This article aims to explore the challenges of territorial management in small and medium-sized municipalities in Brazil, considering the fragmentation of management spheres and the need for sustainable solutions. The interdisciplinary methodology involves a literature review, analysis of IBGE data, MapBiomas and evaluation of public policies. The systemic approach of Nature-Based Solutions (NBS) shows promise in promoting sustainable development, with the conservation/regeneration of ecosystem services as a possible complement to sustainable development strategies, providing lasting solutions to urban challenges. The quality of groundwater and surface water in river basins, as well as aspects related to the remaining fragments of native vegetation, show that many environmental problems produced in cities go beyond the limits of the urban area and even the administrative limits of municipalities. This becomes evident when mismanagement of sanitation services and land use in rural and urban areas affect ecosystem services that are essential for the quality of life of the population, the economy of municipalities and the construction of a sustainable city.

KEYWORDS: The Sustainable Development Agenda, Sustainable Cities, Sustainable Development Indicators, Nature-Based Solutions

1 INTRODUCTION

The increase in population in urban areas has transformed the distribution of the population in geographic space. In 1950, only 30% of the world's population lived in urban areas, a proportion that grew to 55% by 2018 (United Nations, 2022). Despite growing at a slower pace since 1950, the world population exceeded 8.0 billion people in November 2022 and is projected to reach around 10.4 billion people during the 2080s (United Nations, 2022).

According to the Brazilian Institute of Geography and Statistics (IBGE, 2017), we increasingly live in an urbanized world organized around cities, with the majority of the world's population and the most dynamic sectors of the economy having strong ties to urban areas. This factor makes the challenges for promoting sustainable urban development increasingly complex, due to: socio-spatial segregation; deficiencies in urban infrastructure; lack of sewage coverage, pollution, and contamination; worsening commute times; housing deficits or precarious conditions; deterioration in quality of life, especially for the most vulnerable populations; in addition to food production and the maintenance of ecosystem services.

From the reality of metropolitan problems, United Nations Agendas emerged in the 1980s and 1990s as a result of international forums promoted by the United Nations (UN), emphasizing the growing importance of cities in the global sphere.

The UN points out that population growth occurs at different rates across regions, causing the global geographical distribution of the population to change frequently. It also found that global population growth has been concentrated in the world's poorest countries, increasing the vulnerability of these populations and reducing their access to essential life goods (UN NEWS, 15/11/2022).

Regarding future population projections, the 2022 World Cities Report (UN-HABITAT) indicates that the world population will be 68% urban by 2050, demanding a new way of managing cities and the resources they consume.

According to the UN, population growth itself may not be the direct cause of

environmental damage, but it can “aggravate the problem or accelerate its emergence, depending on the problem in question, the timeframe considered, available technology, and demographic, social, and economic context” (United Nations, 2022, p.13).

The UN’s work in inducing public policies related to the environment and urban areas began to gain prominence in the 1970s. It was during this time that two significant conferences took place that boosted the UN’s actions in this field: the United Nations Conference on the Human Environment in 1972 in Stockholm, and the United Nations Conference on Human Settlements in 1976 in Vancouver (Barbieri, 2020, p. 149).

The centrality of the urban theme and the recognition of the city as an essential factor for sustainable development led UN member states to acknowledge the need for more inclusive, safe, resilient, and sustainable urbanization, resulting in an agenda for sustainable development, the 2030 Agenda.

Making a city sustainable implies seeking better urban environment planning, prioritizing the population’s quality of life. Among the aspects that contribute to this goal are improving urban mobility, reducing noise and air pollution, proper solid waste management, increasing energy efficiency, and promoting water economy.

In the perspective that the majority of the population will live in cities by 2050, the UN created a specific goal in the 2030 Agenda, which includes the Sustainable Development Goals (SDG) for cities and human settlements, SDG 11 – Sustainable Cities and Communities. This goal aims to make cities and human settlements inclusive, safe, resilient, and sustainable, based on the opportunity to discuss, understand, and monitor the phenomenon of urbanization (UN-Brasil, 2019).

SDG 11 is clearly focused on cities and human settlements, the construction and monitoring of indicators with greater disaggregation at the municipal level would be fundamentally important for the development of strategic public policies for local and regional planning, as policies built from everyday realities would have more lasting and effective impacts.

With continental proportions, Brazil has distinct characteristics in each region of the country and even regionalities within the same state. The adaptation of indicators for monitoring the 2030 Agenda to the Brazilian reality was entrusted to the Instituto de Pesquisa Econômica Aplicada (IPEA)

In this context of differentiated realities, solutions proposed by developed countries, where the economic pillar of sustainable development is more resolved, that goals proposed by these countries must be adapted to other realities.

According to Grostein (2001, p. 15), urbanization in Brazilian metropolises shows an evolution with serious environmental consequences, including soil erosion, floods, landslides, deforestation, and pollution of water and air resources. These problems disproportionately affect low-income populations, highlighting the state's neglect in city construction and urban development policy formulation. The peripheral urbanization model, resulting from the lack of an effective metropolitan housing policy and insufficient public production of social housing, has exacerbated illegality as a structural factor in the expansion of Brazilian metropolises, leading to precarious housing options such as irregular settlements, favelas, and tenements.

According to the demographic census conducted in 2022 (IBGE, 2023), Brazil has 15

metropolises, municipalities with more than 1 million inhabitants, totaling a population of 40.5 million inhabitants, which represents 19.9% of the national population.

Municipalities with more than 100,000 inhabitants amount to 278 municipalities, accounting for 23.417.569 million inhabitants, representing 11.5% of the country's total population.

The analysis conducted by IBGE (2023) and MapBiomias (2022) reveals that Brazil has 2,451 (44.88%) municipalities with a population below 10,000 inhabitants, grouping 12.8 million inhabitants. These are small cities that, in many cases, face economic difficulties, lack access to services, and have unqualified technical staff, among other issues, making it difficult for them to offer infrastructure and equipment for the population, especially according to sustainability principles.

Despite governance challenges, small and medium-sized cities often have valuable natural and cultural resources that can be sustainably exploited. From these aspects, the comparative exercise between Brazilian capitals and small and medium-sized cities is justified by the fact that predominant metropolitan studies do not portray other urban realities, which could lead to the formulation of policies that do not consider the specificities of Brazilian cities, diverse from north to south of the country.

In accordance with MapBiomias study on land cover and use in Brazil, in 2022, urbanized areas in Brazil totaled 3.7 million hectares, corresponding to 0.4% of the Brazilian territory, with the greatest growth of urbanized areas occurring in the urban concentrations of medium-sized cities (MapBiomias, 2022, p.2). The importance of sustainability studies for small and medium-sized cities in Brazil is emphasized by: the significant portion of urban areas still to be built by 2030, offering the opportunity for sustainable urban planning from the outset, avoiding mistakes made in larger cities; the rich biodiversity often found in these locations, demanding strategies for ecosystem conservation amid urbanization; the response to specific challenges such as limited access to services and inadequate infrastructure, requiring contextualized approaches; the promotion of quality of life through green spaces, clean air, and quality water resources; the reduction of future impacts such as waste management and climate change mitigation; and the necessary balance between economic growth and conservation, directing city development in an equitable and resilient manner.

In this scenario, studying small and medium-sized cities with their sociocultural and territorial differences becomes an important opportunity to bridge the gap between the idealized city in guidelines, agendas, programs, and laws, and the everyday reality, definitively structuring cities that sustain themselves, that is, that have a future grounded in the present. This broader focus takes into account factors such as climate change, continuous urbanization, and future resource demands.

To situate the research problem, the assumption of the study emerged from the premise that land use in Brazilian municipalities has socioeconomic and environmental differentiations that demand indicators more consistent with reality, which would assist in meeting the SDGs's targets.

Directing the study towards sustainable cities, which would be a "place that has a durable stock of natural resources to ensure the sustainability (durability) of social, economic, and physical development, and that has lasting security against environmental risks that

threaten its development” (UNCHS/UNEP, 2005) for small and medium-sized cities, gives us the possibility to enhance existing solutions and propose others that can contribute to the development of policy tools incorporated into urban planning.

From these premises, the present study addresses, in the context of the increasing population in cities and under the perspective of the UN's SDG 11, the challenges of territorial management of Brazilian municipalities in the face of the fragmentation of management in distinct spheres that attempt to adapt the established city to the requirements determined by different legislations and the principles that make it fit the intended sustainable development.

As the study's subject, four cities in the West and Northwest of São Paulo state were selected, two medium-sized and two small-sized. The main municipalities in this region include Araçatuba and Presidente Prudente, which are addressed in this study as medium-sized municipalities, and Álvares Machado and Tupã, as small-sized municipalities.

Considering the objective of this research, the study sought support in the qualification of concepts through bibliographic research, conducting an investigation on the theoretical principles related to sustainability, sustainable cities, Nature-Based Solutions, ecosystem services, environmental services, and other relevant concepts that help in understanding sustainability in cities.

It was based on the premise that the national indicators available on the ODSBrasil platform monitor, among their many indicators, basic sanitation services such as: water treatment, sewage, waste collection, as well as the urbanization of slums, reduction of people affected by disasters, and that such indicators portray urban areas of large centers and metropolises, where land use and occupation are largely consolidated. It was also evaluated whether the proposed indicators favor planning that will lead cities to sustainability, considering the supporting goods (ecosystem services) that sustain them.

Based on the theoretical foundation, a qualitative research of descriptive and exploratory nature was conducted, in which data were collected from the cities under study: Presidente Prudente, Araçatuba, Tupã, and Álvares Machado, located in the State of São Paulo.

The municipalities studied are located in the West and Northwest regions of São Paulo and have similar characteristics regarding the proportion of the municipal territorial area, consisting of urban areas and rural zones. The economic activities are mainly related to the provision of services and agricultural production.

A case study approach was adopted, which, according to Gil (2007), consists of an in-depth and exhaustive investigation of a few objects, allowing for their detailed understanding. As highlighted by Yin (2015), the case study, as a research method, is suitable for examining a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and its context are not clearly evident.

The data collection was carried out through secondary data (bibliographic and documentary research), that is, already produced prior to the realization of this study. The data used through the documentary review were those contained in federal, state and municipal laws that deal with Brazilian governance plans and guidelines, as well as the guidelines established in the UN agendas.

This research used the information made available on the federal government platform, ODSBrasil Platform and also used as a reference the information inserted in

platforms of the Government of the State of São Paulo, as the initiative Programa Município VerdeAzul (PMVA), which was created by the Secretary of Environment of the State of São Paulo (current Secretary of Environment, Infrastructure and Logistics), and the action Programa Cidades Sustentáveis (PCS) created by the Sustainable Cities Institute, in addition to sources such as IBGE, MapBiomias, which allowed access to a range of data and information, essential for the development of the work. It was also used, together with the proposal of the UN agendas and program, the legal framework in force in the country to give theoretical support to the Ideal City or a more sustainable city.

Data and information obtained from national sanitation information system and environmental company of the state of São Paulo were also used.

It should be noted that plans and programs that seek to discipline or regulate the problems of land use and management exist at all levels of government, however, the fragmented application of public policies, the lack of effective communication between sectors and interests, often conflicting, hinder intersectoral governance and the achievement of the goals idealized as a strategy for sustainability.

As happened in Paris, the hygienist and technical model served, in Brazil, as a backdrop for the expulsion of the poor populations to the peripheries and, as Maricato (1996, p. 18) states “urban reforms expelled the “surplus mass” (blacks, beggars, people without documents, unemployed in general) from the most central or more valued urban places by the transforming market”

For Fernandes (2021, p.3), the rapid urbanization process that occurred in Brazil took place without a minimally adequate legal basis, having been at first only of a regulatory nature “in addition to being totally dissociated from the existing mechanisms and processes of urban management and financing of urban development”, linked to the idea of imposition of “administrative limits” or “external administrative restrictions” to the property

This lack of a solid legal structure, which adequately supported the growth of cities, may have been the beginning of the challenges in managing urban areas.

The State is absent from the policies of planning and management of urban space and through extensive urban legislation, it limits itself to regulate:

[...] the production and expansion of cities, through laws of partitioning, zoning and urban plans, delegating to the private developer the mission of producing urbanized land, with infrastructure and public spaces for the expansion of the city (Rolnik; Klink, 2011, p. 103).

In light of the above, when proposing sustainable cities, what exactly is being sought? Starting from the premise that the world population is moving towards an urban society, it is necessary to reflect on the demands and needs of this society, its dynamics, the socio-environmental problems that are generated and the challenges for their confrontation.

2 IDEALIZED FUTURES AND THE CITY OF THE PRESENT

The model of a “sustainable city”, emerged within the scope of international organizations, is the extension, to the local sphere, of the operationalization of the notion of

sustainable development, conceived as that which ensures the meeting of the needs of the present without compromising the needs of future generations. (Acserlrad, 2009, p. 105-106).

For Acselrad (2009), the debate on urban sustainability begins by evoking the idealized and desirable futures that are intended to become reality in urban spaces, discriminating everything that may make the desirable duration of cities unfeasible - pollution, urban congestion, violence. Still according to the same author "What characterizes contemporary cities under the effects of globalization is precisely the deep social inequality in exposure to environmental risks" and "also, the unequal access to environmental resources such as water, sanitation and safe soil".

Acselrad (2009) states that,

"Cities have become increasingly central to capital accumulation and, at the same time, crossed as they are by the effects of productive restructuring and the flexibility of accumulation - read socio-spatial segregation, overload of urban transport routes, dissemination of violent political conflicts, they have become the object of different discourses on "urban sustainability", both by multilateral agencies and by a set of social agents who intend to build the so-called global networks of sustainable cities. To this end, they dedicate themselves to elaborating the attributes that would constitute the notion of a "sustainable city" (Acselrad, 2009, p. 20)."

For the United Nations Centre for Human Settlements (UNCHS – Habitat), a sustainable city would be a place that has a durable collection of natural resources to ensure the sustainability (durability) of social, economic and physical development, and that has durable security against environmental risks that threaten its development (Limonad, 2013)."

Thinking about sustainable cities involves thinking about the use of territory in a systemic way. For Capra (1996), the applicability of the systemic paradigm theory lies in the renewal of how we think about life and the biosphere, renewing social actions and the social fabric as a whole. For this, Capra (1996) argues that ecological science contemplates a new interdependent view of living beings, and systems theory unfolds in the concept of "Gaia", or the biosphere as a living organism and, at the moment that this consolidates within the educational process, values would take a turning point, "the point of mutation" (Capra, 1996)

The more we study the main problems of our time, the more we are led to realize that they cannot be understood in isolation. They are systemic and complex problems, which means that they are interconnected and interdependent (Capra, 1996; Morin, 1980). As Morin (1980) reinforces, another approach is necessary to face complexities from a socio-environmental perspective.

In view of the above, the perspective of sustainability seeks a balance between the needs of present and future generations, ensuring that the use of natural resources does not compromise the ability of future generations to meet their own needs. It is a matter of technical support "as a technical issue related to urban planning, traffic management, adoption of clean technologies and urban design" (Limonad, 2013)."

For IBGE (2022, p.9) "the land is a fundamental element for the development of economic activities" and in it are expressed the diversity, concentration and inequality of various geographical phenomena. And, despite the comprehensive panorama of synthesis indicators of the economy, the benefits of nature on which economic activities and human

well-being depend have not been well measured.

According to Convention On Biological Diversity (CBD) (2020):

“Urban areas are expanding more rapidly than urban populations and this urban expansion will use a large amount of natural resources, including water, on a global scale, and will consume quality agricultural land, with adverse effects on biodiversity and ecosystem services everywhere. Most of the urban expansion will occur in areas of low economic and human capacity, which will limit the protection of biodiversity and the management of ecosystem services (CBD, 2020).”

Going along with the MMA’s forecast in 2012, the MapBiomias project (2022) found that urbanized areas in the country went from 1.2 million hectares in 1985 to 3.7 million in 2021, representing 0.44% of the entire Brazilian territory, with most of this expansion occurring over areas of agricultural use (MapBiomias, 2022). Of the 2.5 million hectares that were urbanized, 67.8% were of agricultural use: 30.7% were pasture areas, 30.5% were use mosaics, and 6.4% were agriculture.

Another finding made by MapBiomias (2022) was the advance of urbanization over areas with native vegetation, pointing to a proportional loss in some states of more than half of their natural cover for urbanized areas. In the period from 1995 to 2021, significant percentages were lost in each biome for urbanized areas. Of the total natural formations converted to urbanized areas, the greatest loss occurred in the Cerrado, with 156.5 thousand ha corresponding to 28% of the total converted (MapBiomias, 2022).

As for the water that sustains the cities, Brazil has a water surface of 16,631,572 ha corresponding to 2% of the national territory, and on the planet to 6% of the surface and 12% of the volume of fresh water (MapBiomias, 2021).

Still on the mapping of water body surfaces carried out by MapBiomias (2021), it was verified that Brazil has been losing the water surface since the beginning of the 1990s. In 30 years, 3.1 million hectares of water surface were lost, a reduction of 15.7%.

The reduction of the water surface in different biomes and states can lead to environmental degradation, compromising biodiversity, in addition to resulting in the irreparable loss of entire ecosystems and their ecosystem services. It can directly affect the water supply for the population and for agricultural and industrial activities.

Regarding its biodiversity, the original biomes found in the São Paulo territory are the Atlantic Forest and the Cerrado. It is estimated that the original area of the Atlantic Forest covered approximately 68% of the state’s area, with the remainder being mainly occupied by the Cerrado. Pastures for cattle, agricultural crops, reforestation with commercial species, extensive areas of sugarcane and urbanized areas, replaced the original ecosystems, whose remnants currently cover 22.9% of the state territory (São Paulo, 2022, p.38).

The focus of environmental management studies on small and medium-sized municipalities is justified by the importance of addressing environmental issues in contexts that often lack adequate resources and attention. In these locations, the impacts of environmental degradation can be significant, directly affecting the quality of life of local populations and the sustainability of economic activities.

It is necessary to consider that in small and medium-sized municipalities, agricultural and agro-industrial activities predominate, creating an increasingly larger interconnection

between urban and rural environments, as modern agriculture becomes more complex and integrated with urban centers. Also for this reason, the use of rural land also influences the quality of life of people in cities, as its management may compromise the provision of ecosystem services.

Furthermore, the implementation of good environmental management practices in smaller municipalities can serve as an example and positively influence awareness and actions at broader levels, contributing to the protection and preservation of the environment on a regional and global scale.

The expansion of urban areas, as well as the types of land use implemented, have a wide range of legal instruments, as well as public policies. Despite the existing legal framework, the laws have not had the necessary effectiveness, given the little or non-existent structure required, whether material or human, to act and strengthen environmental protection.

It is important to note that the instruments intended for urban planning are fragmented in various established legal frameworks, which makes it essential for governments, society, and particularly public managers, to promote the integration of these tools.

Environmental problems do not respect administrative boundaries and, for this reason, there is a need for a more comprehensive look at the issues that affect the environment and the population. More localized actions, having watersheds as a spatial unit of reference and action, can have effective results, especially if it involves situations that impact more than one municipality, for example.

Analyzing Brazilian legislation, both urban and environmental, the proposals contained therein regarding the ordering and proposition of guidelines aimed at dealing with public order problems are there, but data from the daily reality of each municipality show that there is a long way to go for the proposed actions to be incorporated in a systemic way in territorial planning.

While Brazilian legislation establishes guidelines and proposals to address environmental issues, such as waste management, the daily reality in many municipalities, such as Álvares Machado, Araçatuba, Presidente Prudente, and Tupã, demonstrates that there is a gap between legislative intentions and practical implementation.

Despite efforts to improve solid waste management in Brazil, as exemplified by the direction given by the National Solid Waste Policy, three of the municipalities in the study, Álvares Machado, Presidente Prudente, and Tupã, dispose of their waste in private sanitary landfills located in other municipalities. This practice, despite providing temporary relief, can lead to logistical problems, socio-environmental impacts, and loss of opportunities for local recycling and reuse.

It is important to highlight that Federal Law 12.305/2010 (BRASIL, 2010) makes an important distinction between solid waste and rejects, emphasizing that only “after all possibilities of treatment and recovery by available and economically viable technological processes have been exhausted” will they be destined for landfills.

The practice of sending urban solid waste to sanitary landfills located in other municipalities contradicts principles of sustainability and goes against initiatives to reverse global warming, as it increases greenhouse gas emissions by transporting waste over long

distances in addition to increasing the consumption of fossil fuels.

The search for sustainability in waste management would be in the development of local solutions such as strengthening the infrastructure for selective collection, recycling, and composting, as well as environmental education campaigns to raise public awareness about the importance of reducing, reusing, and recycling waste.

It is crucial for sustainability that municipalities seek local and collaborative solutions, developing waste management infrastructure that includes selective collection, recycling, and composting, while at the same time fostering regional partnerships to jointly face the challenges of waste management.

Regarding the Landfill Quality Index (Índice de Qualidade do Aterro (IQR) in original Portuguese) of Presidente Prudente, Álvares Machado, and Tupã, there was a significant increase from the moment they started to landfill their urban solid waste in private landfills located in other municipalities.

Regarding the management of domestic sewage, Brazil has specific legislation, such as the National Water Resources Policy - Federal Law No. 9,433/97 (BRASIL, 1997) and the National Basic Sanitation Policy - Federal Law No. 11,445/07 (BRASIL, 2007), which establish guidelines for the sustainable use of water and the proper management of sewage. Despite the guidelines established in these laws, Brazil, due to its territorial extension, the diversity of economic activities, and the lack of adequate infrastructure in many regions, faces several challenges, such as low collection rates and, mainly, sewage treatment.

As for the collection, treatment, and pollutant load of domestic sewage, Araçatuba and Tupã do not collect 100% of the effluent generated in the urban area and as for the efficiency of the treatment, none of the four municipalities studied are 100% efficient in treating effluents, and in two of the municipalities, there is a discharge of remaining organic load into the receiving water bodies, contributing to the pollution of the springs.

Even though the indicators of sustainable cities emphasize the integration between urban and rural areas, there is a significant gap regarding the effluents generated, especially in rural areas. Considering the importance of these regions for the recharge of groundwater, it is imperative to establish more rigorous control of land use, particularly with regard to the use of pesticides, fertilizers, protection of springs, treatment of effluents, and adherence to the Forest Code. Agriculture plays a crucial role in the generation of effluents, especially when inappropriate practices of waste management of pesticides and fertilizers are adopted, leading to infiltration into the soil and contamination of groundwater. The contamination of these areas has substantially contributed to the impairment of groundwater.

According to a report by CETESB (2022) regarding the quality of groundwater, in the period from 2019-2021, of the samples collected in the 42 municipalities belonging to UGRHI 19 - Lower Tietê, regarding the potability standards defined by Ordinance GM/MS No. 888/2021, of the one hundred and fourteen (114) scheduled samples, seventy-six (76) water samples were collected for physical-chemical and microbiological analyses. Parameters not in conformity with the potability standards were found in twenty-nine (29) samples, representing 38% of the total analyzed.

According to CETESB (2022, p.162) in UGRHI 19, "the majority of non-conformities are related to the presence of Total Coliforms and *Escherichia coli*. Concentrations of

Chromium above its Maximum Permitted Value (MPV) were observed in two wells located in Sud Menucci, where non-conformities for this parameter are frequently recorded”.

Regarding the presence of Nitrogen Nitrate, Araçatuba, Luiziânia, Magda, and Vista Alegre do Alto are those that had concentrations above 10 mg N L⁻¹ in all samples analyzed in the triennium, which by the presence of this component demonstrate anthropic alterations of the quality of groundwater (CETESB, 2022, p.181).

In the 15 municipalities belonging to UGRHI 20 - Aguapeí, nineteen (19) non-conforming water samples were identified among the fifty-six (56) collected and analyzed; for the triennial, the collection of ninety (90) samples had been scheduled for this UGRHI (CETESB, 2022, p.168).

According to the same report, Total Coliforms, individually, were responsible for 63% of the non-conforming samples, and are still present in more samples together with other parameters. Concentrations above the respective MPVs for Barium, Chromium, Fluoride, and Nitrate were also observed at only one point for each of these parameters (CETESB, 2022, p.168).

Regarding the results obtained in UGRHI 21 - Peixe, according to CETESB (2022, p.73), of the ninety-six (96) water sample collections scheduled for the triennial, 61.5% were carried out. The analyses demonstrated non-compliance with potability standards in twenty-one (21) of the fifty-six (56) samples collected. Also according to CETESB (2022, p. 173), “Concentrations of Chromium above its MPV historically occur at the monitoring points of Alfredo Marcondes, Álvares Machado, Caiabu, and Flórida Paulista. Nitrate at the points of Bastos and Inúbia Paulista and Barium at the point of Oriente above MPV are also recurring”.

In the municipalities of Araçatuba and Presidente Prudente, the presence of volatile and semi-volatile organic compounds was also detected in the monitoring of Organic Substances and Estrogenic Activity. In the second sampling campaign in 2021 in the municipality of Araçatuba, the following were also detected in the samples: a) Triazine Herbicides; b) Herbicides Metolachlor, Molinate, Pendimethalin, Propanil; c) Organochlorine Pesticides; d) Organophosphate Pesticides; e) Pesticides 2,4,5-T, 2,4,5-TP, 2,4-D, Aldicarb, Aldicarb Sulfone, Aldicarb Sulfoxide, Azoxystrobin, Benazolin, Carbaryl, Carbendazim, Carbofuran, Carbosulfan, Cyproconazole, Dimethoate, Diuron, Fipronil, Fluazifop-P-butyl, Imidacloprid, MCPA, Methomyl, Tebuconazole, Tebuthiuron, Thiamethoxam, Thiocarb, Trichlorfon (CETESB, 2022, p. 228).

CETESB (2022, p. 203) states that in groundwater, nitrate is usually found in low concentrations. Concentrations above 5 mg N L⁻¹ are considered indicators of contamination caused by human activities, and CETESB has adopted this value as a prevention limit. However, when water contains nitrate concentrations above 10 mg N L⁻¹ (as established in ordinance GM/MS nº 888/2021), its consumption may pose health risks, increasing the likelihood of diseases such as methemoglobinemia (cyanosis) and gastric cancer.

The same company also points out that the presence of nitrate in groundwater can originate from inadequate agricultural practices, such as the excessive use of organic and synthetic fertilizers containing nitrogen. Additionally, in situ sanitation systems, such as cesspools, septic tanks, and pit latrines, can contribute to contamination. Leaks in sewage collection networks and the influence of contaminated rivers in well-capture areas are also

potential sources of nitrate contamination (CETESB, 2022, p. 203).

Nitrate contamination, often resulting from inadequate agricultural practices and sanitation systems, compromises groundwater quality, directly affecting the ability of cities to provide safe drinking water for their inhabitants. Basic sanitation is addressed in SDG 6 (Clean Water and Sanitation), but it is directly linked to SDG 11 (Sustainable Cities and Communities), considering that groundwater contamination represents a latent threat, while water remains a vital resource to sustain cities, essential for public health and quality of life.

3 FINAL CONSIDERATIONS

It is concluded that if the precepts established by law are followed, existing tools are used systematically, and continuous improvement is aimed for, the process of improving municipal management would already be incorporated.

Goals in public management are essential guidelines for prioritizing objectives, directing resources, and ensuring the quality of public services. They guide short, medium, and long-term actions, integrate sectors, demand reliable data, and involve society, promoting transparency and accountability. Well-founded goals support government efficiency, ensure lasting policies, and serve as benchmarks to achieve a future vision that meets the needs of the population and the territory.

The main issues with the platforms for monitoring sustainable development in municipalities are gaps in the availability of information, national delimitation, and data collection frequency.

Regarding indicators applicable to small and medium-sized cities, we agree with Torre (2023, p. 29) that “the scale of Brazilian public policies for urban and environmental planning prioritizes metropolises and large cities, neglecting the agenda and needs of the vast majority of small municipalities.”

Brazilian municipalities have a powerful planning tool in the Master Plan, which, if periodically revised and followed, would make significant contributions to improving and updating management. Combined with Nature-Based Solutions (NBS), it would bring feasible and lasting solutions. Studies by Benini (2015), Louzada (2022), and Minaki (2007) in the studied cities show that applying NBS is a viable path.

Particularly in Tupã, Benini (2015) demonstrates that implementing NBSs, such as creating linear parks, revitalizing squares, and restoring riparian forests, led to reduced flooded areas and related problems. Additionally, increased vegetated areas enhance ecosystem services.

Based on the indicators from the studied cities, NBS is a viable proposal to view the city and its natural processes through the lens of environmental recovery and conservation. If incorporated into urban planning and considered alongside municipal environmental zoning, this approach can be a potential tool for addressing social and environmental issues in municipalities.

The quality of groundwater and surface water in watersheds, as well as aspects related to remaining fragments of native vegetation, shows that many environmental problems produced in cities go beyond urban and even municipal administrative boundaries.

This becomes evident when poor management of sanitation services and land use in rural and urban areas affects essential ecosystem services for the population's quality of life, the economy of municipalities, and the construction of a sustainable city.

REFERENCES

ACSELRAD, Henri. **A duração das cidades: sustentabilidade e risco nas políticas urbanas**. Rio de Janeiro: Lamparina, 2009.

BARBIERI, José Carlos. **Desenvolvimento sustentável: das origens à Agenda 2030**. Editora Vozes, 2020.

BENINI, Sandra Medina. **Infraestrutura verde como prática sustentável para subsidiar a elaboração de planos de drenagem urbana: estudo de caso da cidade de Tupã/SP**. 2015.

BRASIL. **Lei n. 9.433, de 8 de janeiro de 1997**. Institui a Política Nacional de Recursos Hídricos, cria o Sistema Nacional de Gerenciamento de Recursos Hídricos e dá outras providências. Diário Oficial da União: seção 1, Brasília, DF, 9 jan. 1997.

BRASIL. **Lei n. 11.445, de 5 de janeiro de 2007**. Estabelece diretrizes nacionais para o saneamento básico; altera as Leis n. 6.766, de 19 de dezembro de 1979, n. 8.036, de 11 de maio de 1990, n. 8.666, de 21 de junho de 1993, n. 8.987, de 13 de fevereiro de 1995; revoga a Lei n. 6.528, de 11 de maio de 1978; e dá outras providências. *Diário Oficial da União: seção 1*, Brasília, DF, 8 jan. 2007.

BRASIL. **Lei n. 12.305, de 2 de agosto de 2010**. Institui a Política Nacional de Resíduos Sólidos; altera a Lei n. 9.605, de 12 de fevereiro de 1998; e dá outras providências. Diário Oficial da União: seção 1, Brasília, DF, 3 ago. 2010.

BRASIL. **Ministério da Saúde. Portaria GM/MS n. 888, de 4 de maio de 2021**. Estabelece os procedimentos e responsabilidades relativos ao controle e vigilância da qualidade da água para consumo humano e seu padrão de potabilidade, e dá outras providências. Diário Oficial da União: seção 1, Brasília, DF, 7 maio 2021

CAPRA, Fritjof. **A Teia da Vida**. Tradução de Newton Roberval Eicheberg. São Paulo: Cultrix, 255p. 1996

CETESB – **Companhia Ambiental do Estado de São Paulo**. *Qualidade das águas subterrâneas no Estado de São Paulo: 2019-2021*. São Paulo: CETESB, 2022.

CONVENÇÃO SOBRE DIVERSIDADE BIOLÓGICA (CDB). Global Biodiversity Outlook 5. Montreal: Secretariado da Convenção sobre Diversidade Biológica, 2020.

FERNANDES, Edesio. Direito Urbanístico: objetivos, desafios e relação com a Arquitetura e o Urbanismo: Reflexões à luz do Estatuto da Cidade. **Cadernos de Filosofia Alemã: Crítica e Modernidade**, v. 19, p. 1-9, 2021.

GIL, Antonio Carlos et al. **Como elaborar projetos de pesquisa**. São Paulo: Atlas, 2007.

GROSTEIN, Marta Dora. MetrÓpole e expansão urbana: a persistência de processos" insustentáveis". **São Paulo em perspectiva**, v. 15, p. 13-19, 2001.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Classificação e caracterização dos espaços rurais e urbanos do Brasil: uma primeira aproximação**. Coordenação de Geografia. Rio de Janeiro: IBGE, 2017. 84p. - (Estudos e pesquisas. Informação geográfica, ISSN 1517-1450; n. 11)

_____. Censo Demográfico 2022. **População e domicílios**. Primeiros resultados. Rio de Janeiro: IBGE, 2023. Disponível em: <<https://biblioteca.ibge.gov.br/visualizacao/livros/liv102011.pdf>>.

LIMONAD, Ester. A insustentável natureza da sustentabilidade. Da ambientalização do planejamento às cidades sustentáveis. **Cadernos MetrÓpole**., v. 15, n. 29, p. 123-142, 2013.

LOUZADA, Raquel Martin. **Análise da qualidade ambiental urbana em Álvares Machado-SP**. 2022.



MARICATO, Ermínia. **Metrópole na periferia do capitalismo – ilegalidade, desigualdade e violência**. São Paulo: Hucitec, 1996

MINAKI, Mônica. **As praças públicas de Araçatuba/SP**: análise de um indicador da qualidade ambiental urbana. 2007.

MORIN, Edgar. **O método II: a vida da vida**. 2.ed. Portugal: Publicações Europa-América, 1980.

ONU News - **Perspectiva Global** Reportagens Humanas, acesso em 10.07.2023 por meio do link <https://news.un.org/pt/story/2022/11/1805342>

ORGANIZAÇÃO DAS NAÇÕES UNIDAS - ONU, **AGENDA 2030**. Nações Unidas Brasil, 2019. Disponível em: <https://brasil.un.org/sites/default/files/2020-09/agenda2030-pt-br.pdf> Acesso em: 01 nov. 2019

Projeto MapBiomias – **Mapeamento Anual de Cobertura e Uso da Terra do Brasil** - Coleção 7, acessado em [05.12.2022] através do link: https://mapbiomas-br-site.s3.amazonaws.com/MapBiomias_Area_Urbanizada_2022_01_11_comentMH.pdf e https://mapbiomas-br-site.s3.amazonaws.com/MapBiomias_Irrigacao_2022_22_11_v2.pdf

Projeto MapBiomias – **Mapeamento da superfície de água no Brasil** (Coleção 1), acessado em [05.12.2022] através do link: https://mapbiomas-br-site.s3.amazonaws.com/MapBiomias_A%CC%81gua_Agosto_2021_22082021_OK_v2.pdf

Projeto MapBiomias – **Mapeamento anual de cobertura e uso da terra no Brasil entre 1985 a 2022** – Coleção 8, acessado em agosto_2021_22 por meio do link: https://brasil.mapbiomas.org/wp-content/uploads/sites/4/2023/10/FACT_Areas-Urbanas-no-Brasil_31.10_v2.pdf

ROLNIK, R.; KLINK, Joroen. Crescimento econômico e desenvolvimento urbano: Por que nossas cidades continuam tão precárias? **Revista Novos Estudos**, São Paulo, n. 89, mar. 2011.

São Paulo (Estado). Secretaria de Infraestrutura e Meio Ambiente. Meio ambiente paulista [recurso eletrônico]: **Relatório de qualidade ambiental 2022** / Secretaria de Infraestrutura e Meio Ambiente, Coordenadoria de Planejamento Ambiental; Coordenação técnica Sheyla Aki Watanabe, Tatiana Camolez Morales Ferreira ; Equipe técnica Anna Karla Cavalcante Moura Ramos ... [et al.] ; Colaboradores Adriana de Arruda Bueno ... [et al.]. – 1.ed. – São Paulo : Secretaria de Infraestrutura e Meio Ambiente, 2022. 1 arquivo de texto (527 p.) : il. color., PDF ; 240 MB Disponível em: <<https://www.infraestruturameioambiente.sp.gov.br/cpla/category/pub/>>

UNITED NATIONS, World **Population Prospects: The 2022 Revision** (Population Division, Department of Economic and Social Affairs, United Nations, New York, 2022)

UN-HABITAT (UNCHS/UNEP) **Sustainable cities programme**. Disponível em <<http://ww2.unhabitat.org/programmes/sustainablecities/aboutus2005.asp>> Acessado em 25/03/2022

YIN, Robert K. Estudo de Caso-: Planejamento e métodos. Bookman editora, 2015.