JOURNAL OF ENVIRONMENTAL MANAGEMENT & SUSTAINABILITY

REVISTA DE GESTÃO AMBIENTAL E SUSTENTABILIDADE – GeAS

Received: 28 Nov. 2021 - **Approved:** 18 Oct. 2022
Responsible editors: Andreza Portella Ribeiro
Evaluation Process: Double Blind Review
https://doi.org/10.5585/geas.v11i1.21185
e-ISSN: 2316-9834

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Management of urbanized public green spaces: case study of the east zone of the city of Cuiabá-MT

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Cite as
American Psychological Association (APA)

Benini, S. M., Godoy, J. A. R. (2022). Management of urbanized public green spaces: case study of the east zone of the city Cuiabá - MT. *Rev. Gest. Ambient. e Sust. - GeAS.*, *11*(1), 1-23, e21185. https://doi.org/10.5585/geas.v1i1.21185.

Abstract

Objective: This research aimed at the quality of Urbanized Public Green Spaces (UPGSs), such as squares, gardens and urban parks, which are intended for leisure and recreation in the contemporary city. As a spatial clipping of the study, the east zone of the city of Cuiabá-MT was chosen.
Methodology: For the development of this qualitative research, methodological procedures were adopted having a logical basis of investigation divided into three phases: open or exploratory, data collection and systematic analysis, and data interpretation.
Originality/Relevance: The relevance of this research is to present a contribution to urban planning and management through methodological procedures that aim at a critical analysis of the management of UPGSs, both simplifying the scale of analysis and identifying the needs and specificities of each studied location.
Result: As a result, it was found that there is a lack not only in the amount of public spaces intended for leisure and recreation, but also in the quality of the UPGSs, which denotes the absence of public policies aimed at urbanization and revitalization of existing green areas.
Theoretical/methodological contributions: The methodology adopted met the objective proposed in this research and proved to be applicable in new studies aimed at measuring UPGSs in other regions of the city of Cuiabá, as well as in other Brazilian cities.
Social / Management Contributions: The results found indicated that its application can support the planning and management of UPGSs and, mainly, constitute a data base for decision-making in the implementation of public policies aimed at improving the rate of green areas per inhabitant.

Keywords: Urbanized Public Green Spaces. Contemporary City. Environmental Quality. Leisure Spaces. Cuiabá.

Gestão das áreas verdes públicas: Estudo de caso da Zona Leste da Cidade de Cuiabá-MT

Resumo

Objetivo: A presente pesquisa teve como objetivo realizar uma análise da qualidade das Áreas Verdes Públicas Urbanizadas (AVPUs), a exemplo de praças, jardins e parques urbanos, os quais são destinados ao lazer e recreação na cidade contemporânea. Como recorte espacial do estudo, optou-se pela zona leste da cidade de Cuiabá-MT
Metodologia: Para o desenvolvimento desta pesquisa qualitativa, foram adotados procedimentos metodológicos que tiveram como base lógica de investigação, dividida em três fases: aberta ou exploratória, coleta de dados e análise e interpretação sistemática dos dados.
Originalidade/Relevância: A relevância desta pesquisa consiste na apresentação de uma

contribuição para o planejamento e gestão urbana por meio de procedimentos metodológicos voltados a realizar uma análise crítica acerca da gestão das AVPUs. simplificando a escala de análise, assim como, identificando as carências e especificidades de cada local estudado.
Resultado: Como resultado, verificou-se que há carência não só na quantidade de espaços públicos destinados ao lazer e recreação, bem como averiguou-se a péssima qualidade das AVPUs, o que denota ausência de políticas públicas direcionadas a urbanização e revitalização das áreas verdes existentes na região.
Contribuições teóricas/metodológicas: A metodologia adotada além de atender o objetivo proposto nesta pesquisa, se mostrou aplicável em novos estudos visando aferir as IAVPUs nas demais regiões da cidade de Cuiabá, como ainda em outras cidades brasileiras.
Contribuições sociais / para a gestão: Os resultados encontrados apontaram que sua aplicação poderá subsidiar o planejamento e gestão das AVPUs e principalmente, constituir uma base dados para a tomada de decisão na implementação de políticas públicas voltadas a melhorar o índice de áreas verdes por habitante.

Palavras-chave: Áreas Verdes Públicas Urbanizadas. Cidade Contemporânea. Qualidade Ambiental. Espaços de Lazer. Cuiabá.

Gestión de áreas verdes públicas: un estudio de caso de la Zona Este de la Ciudad de Cuiabá-MT

Resumen
Objetivo: La presente investigación tuvo como objetivo realizar un análisis de la calidad de las Áreas Verdes Públicas Urbanizadas (UPV), como plazas, jardines y parques urbanos, que se destinan al ocio y la recreación en la ciudad contemporánea. Como recorte espacial del estudio, se eligió la zona este de la ciudad de Cuiabá-MT
Metodología: Para el desarrollo de esta investigación cualitativa se adoptaron procedimientos metodológicos que tuvieron como base lógica de investigación, divididos en tres fases: abierta o exploratoria, recolección de datos y análisis sistemático e interpretación de datos.
Originalidad/Relevancia: La relevancia de esta investigación consiste en presentar un aporte a la planificación y gestión urbana a través de procedimientos metodológicos tendientes a realizar un análisis crítico de la gestión de las UVP. simplificando la escala de análisis, así como identificando las necesidades y especificidades de cada lugar estudiado.
Resultado: Como resultado se encontró que existe carencia no solo en la cantidad de espacios públicos destinados al esparcimiento y la recreación, sino también la mala calidad de las UVPU, lo que denota la ausencia de políticas públicas dirigidas a la urbanización y revitalización de áreas verdes existentes en la región.
Contribuciones teóricas/metodológicas: La metodología adoptada, además de cumplir con el objetivo propuesto en esta investigación, demostró ser aplicable en nuevos estudios destinados a medir los IAVPU en otras regiones de la ciudad de Cuiabá, así como en otras ciudades brasileñas.
Aportes Sociales / Gestión: Los resultados encontrados indicaron que su aplicación puede apoyar la planificación y gestión de las UVP y, principalmente, constituir una base de datos para la toma de decisiones en la implementación de políticas públicas dirigidas a mejorar la tasa de áreas verdes por habitante.

Palabras clave: Áreas Verdes Públicas Urbanizadas. Ciudad Contemporánea. Calidad del medio ambiente. Espacios de Ocio. Cuiabá.

Introduction

The 20th century was a period of great transformations for several areas, especially for urbanism. In the current context, since the last decades, the number of people who inhabit cities is huge, revealing a growing trend, as the world society presents itself increasingly urban. This scenario has been contextualized in several studies, and even in recent reports published

by the UN (2021)[1], where the urbanization rate reached 55% of the world population living in urban areas, with a forecast that could reach 70% by 2050.

In view of other research and forecasts already carried out in this field of knowledge, the state of alert that these data provoke in the entire international community is undeniable. However, whatever the scale of action, scenarios arising from this context show the importance of studies, research that can contribute to facing the numerous adversities that have marked the urban world, particularly in Brazilian cities - intensely unequal and unfair.

In the context of Brazilian cities, environmental urban planning processes envision possibilities that can not only mitigate the negative impacts of urbanization, but essentially contribute to improving the environmental quality of urban space by dedicating themselves to the promotion of Urbanized Public Green Spaces (UPGSs) in its various typologies, whether squares, gardens or urban parks.

Regarding the importance of public green areas, the literature has been generous, considering the diversity of approaches and the number of researchers who have dedicated themselves to this issue over the last few years. In a special way, when dealing with environmental quality, Jesus and Braga (2005, p.208) start from the premise that life and environment are inseparable, therefore, environmental quality is linked to quality of life, establishing an interaction and a balance that adapts to time and place.

With this concern, many studies that approach UPGSs emphasize their environmental functions, considering the scope of their benefits, as they act in the control of air humidity and temperature; contribute to improving soil fertility and moisture, protecting against erosive processes; and yet, they minimize air pollution and reduce noise levels, serving as a noise buffer in cities.

Within the scope of the presented problem, this study aimed at the qualitative analysis of UPGSs, for which it adopted as a case study, the east side of the city of Cuiabá-MT, given the specificities of its environmental, social and cultural aspects that mark the local and regional landscape.

State of art

When considering the scenarios of contemporary cities, this article intends to present a contribution to urban planning and management through a critical analysis of the possible procedures to be applied in the management of UPGSs. Thus, to support the analysis to be carried out, it became important to introduce key concepts, specifically, those that are interrelated with the proposed theme - in particular, landscape planning and issues of public green areas, essential to the procedures empirical evidence of this research. However, due to

[1] Available at: https://unric.org/pt/onu-preve-que-cidades-abriguem-70-da-populacao-mundial-ate-2050/ Accessed Nov15, 2021

the format limitations, specific to this essay and, above all, the enormity of approaches carried out by numerous researches in different areas of knowledge, it was limited to presenting the aspects that are of interest for the development of this study.

When dealing with issues related to the processes of natural and anthropic alterations that affect the landscape, specifically in urban landscapes, studies by Benini (2015) present methodological procedures that allow the knowledge of such events through a qualitative analysis.

For this approach, the concept of landscape proposed by Leite (1994, p.7) proved to be relevant, understood as the "result of the balance between multiple forces and temporal and spatial processes". In a broad sense, Magnoli and Macedo (2000, p. 132-133) present it

> [...] with broad, complex, but rather vague, indistinct, incomplete meanings; common premises were "nature" and the censure of man's action. The perception of natural changes – of biological times – and also those rapid, extensive and diffused ones of the work of man – of historical times – raised again the man-nature relationship. It would be this relationship with all appeals and judgments – imprecise, undefined – that would be associated with the word "landscape".

Based on this conception, it should also be added that "landscape is like the morphological expression of different forms of occupation, therefore, of changes in the environment in a given time" (MACEDO, 1999, p. 11).

> Hence, the concept of environment can be summarized as the interaction of society with physical support, whether it has an appearance commonly called "natural" or constructed. The interaction takes place in the geographic space through adaptations, transformations, readaptations and new transformations of the successive forms found, elaborated and re-elaborated. These conformations, configurations, loaded with supported social interaction, we have called LANDSCAPES. (MAGNOLI, 1994, p. 60).

Certainly, the concept of landscape raises a series of concepts and interrelationships, notably those that establish connections with the environment, considering that "Each landscape contains spaces, places where entire communities live, and may contain parts or all of different ecosystems." (MACEDO, 1999, p. 13). When considering all these aspects, it becomes important that they contribute to their idealization, the environmental, functional and aesthetic attributes that form a landscape, in view of the complexity of their interactions:

> a) the functional characteristics of physical support, both of the soil and the subsoil, their drainage networks, the aquifers and their susceptibilities to anthropic action;
> b) the climatic characteristics of the place and the different ways and possibilities of adaptation of the communities of living beings to these characteristics;
> c) the characteristics of existing ecosystems – their main forms of life and their value in the context of the place and the country, in addition to their potential for use, in terms of resources, for human society;
> d) the social and, therefore, cultural values attributed to the place and their implications for the survival of different forms of social behavior;
> e) human occupation patterns – both urban and rural, their size, dimension, trends and expansion possibilities and their forms of relationship with physical support structures and existing ecosystems and their forming agents;

> f) the degree of processing of existing environmental structures and the convenience of their transformation in the medium and short term, that is, the measurement of the levels of transformation of the various environmental structures in each area, their potential for use and survival in the face of a process of human use, exploitation and occupation. The objective, in this case, is to evaluate the real stock of environmental resources, their levels of productivity and their absorption and recovery capacity in the face of different forms of exploitation;
> g) the characteristics of the elements that make up the morphological structures of the landscape (either the physical support or the vegetation), the different forms of human occupation: cities, fields, industries, roads and water. In this sense, the exceptionality factor in relation to a given scalar reference must be considered, and the greater the landscape value of this or those, such as a country, a state, a sector or a small segment of the territory. The prevailing cultural patterns, which are extremely variable within society, in space and in time, must also be considered. (MACEDO, 1999, p. 13).

The relevance of such aspects is indisputable, given their scope, functional and climatic characteristics, as well as the specificities of local and regional ecosystems, in their combination they make it possible to understand the essential elements for the constitution of life and its values in the context of the environment in any of the scales of scope and dimensions considered. From this approach, the recognition of such aspects, "constitutes the first step towards the review of attitudes and values in the face of understanding the interfaces that permeate the relationship between man and nature, which involve the physical and sociocultural aspects of a particular location" (ROSIN, 2014, p. 5).

This understanding is essential for the recognition of the relevance of open spaces for public use, be they - urban parks, gardens or squares, insofar as they adopt green as a structuring element of the landscape, becoming a determining factor for the conception of the urban project.

In order to understand how these typologies influence landscape planning, it is assumed that, in the context of cities, urban green areas belong to the category of public open space systems, with characteristics aimed at restoring natural elements, regardless of the size of vegetation. (MILANO, 1993). In the same sense, Cavalheiro et al. (1999) state that green areas are “a special type of open spaces where the fundamental element of composition is the vegetation”. For Lima et al. (1994, p. 549) green area is a category of open space, characterized by the predominance of arboreal vegetation, such as “squares, public gardens and urban parks”[2]. When dealing with green areas, in particular, the functions performed by vegetated spaces Nucci (2008, p. 120), adds that, for an area to be called a green area, it must contain vegetated spaces that fulfill “three functions (aesthetic, ecological and leisure)”, in addition to having a vegetation cover and “permeable soil (without slab) that must occupy at

[2] “Gardens are spaces intended for the permanence and contemplation of nature, they emphasize the sociocultural character, leisure, recreation and biophysical aspects in the urban context, they can be considered as a structuring element of the landscape, as it allows connectivity between the architectural elements of the city” . (BENINI, 2015, p. 101). However, it should be noted that these spaces are culturally called square[2], generating some confusion for the identification of public green areas. In this sense, square as one of the typologies presents a different category of public place, affected as common use (Law of Land Parceling, Federal Law nº 6.766/79), with buildings of significant architectural value, where according to Silva (2008), are strictly related to “social, religious, civic, etc”. Regarding urban parks, it should be considered that this typology is characterized in the urban fabric (as a rule) by large green spots. Falcón (2007, p. 46) explains that the “*parques cuentan con una cobertura vegetal importante, en la que domina el estrato arbóreo, pero también muestran una presencia considerable de arbustos y de plantas vivaces y tapizante”.*

least 70% of the area".

Regardless of their classification regarding the title, whether the green areas are public or private property, in either of the two categories, the presence of tree extracts (not only trees) with a significant vertical dimension is necessary, in order to fulfill social, ecological objectives , scientific or cultural (NOGUEIRA; WANTUELFER, 2002).

Thus, for the purposes that guide this study, the adoption of the concept of public green areas presented by Benini (2009) proved to be relevant,

> [...] all open space (green / leisure area) that has been affected as common use and that has some type of vegetation (spontaneous or planted), which can contribute in environmental terms (photosynthesis, evapotranspiration, shading, permeability, conservation biodiversity and mitigate the effects of noise and air pollution) and that is also used for social, ecological, scientific or cultural purposes. (BENINI, 2009, p. 71).

This approach is relevant, insofar as they are considered spaces for common use by the people, as they impose on the municipal administration, as well as on the "collection (society as a whole), the duty to defend and preserve such spaces (green areas). public), as they can contribute to a healthy quality of life and, consequently, to environmental quality" (BENINI, 2009).

Under this approach, Nucci (2008, p. 109) emphasizes the conditions of comfort and well-being promoted by green areas, in countless possibilities of pleasant use aimed at minimizing the "anguish" of the city, allowing the individual to interact with nature.

> These environments should be pleasant and aesthetic, with varied accommodations and facilities to facilitate individual choice. They must be free from monotony and free from the difficulties of space and the anguish of urban agglomerations. Especially for children, it is essential that the open space provides the possibility to experience sounds, smells, textures, taste of nature; walking barefoot across the sand, lawn; have contact with animals such as birds, small mammals and insects, etc. (NUCCI, 2008, p. 109).

This view is complemented by Gomes (2005, p. 57) when the author highlights the benefits of green areas for psychological and social well-being, as they influence "the state of mind of individuals with mass disorder in large cities". By adding new attributes, this understanding is expanded, as this author also states that vegetation provides a series of environmental improvements, whether mitigating air pollution through photosynthesis, improving air humidity and temperature conditions.

Thus, when dealing with the various functions performed by green areas in the urban context, Loboda and Angelis (2005) highlight their significant contribution to improving the quality of life and urban space. On this issue, many authors, including Gomes (2005), attribute to green areas their intrinsic ability to provide thermal comfort, since these green surfaces positively interfere in the formation of microclimates.

With regard to such aspects, it is important to emphasize that wooded spaces intercept solar radiation, contributing to attenuate soil temperature, as tree massifs absorb part of the solar radiation for their metabolism (photosynthesis). In addition, the movement of air between the leaves takes away much of the heat absorbed from the Sun. According to Spirn (1995) in the context of cities, green areas are different due to their bioclimatic functions, in particular, in the attenuation of solar radiation, when carrying out evaporation and transpiration.

> In the city, concrete, stone, brick and asphalt replace the natural vegetation cover of the countryside. These materials absorb heat more quickly and hold it in greater amounts than plants, soil and water. [...] During the whole day, the pavement, walls and roofs absorb and conserve the heat of solar radiation. Although water and plants also absorb solar radiation, most of this energy is spent on evaporation and transpiration – resulting in more heat loss than is absorbed. [...] The city cools more slowly: it has absorbed more heat, and the radiation of this heat to the night sky is inhibited by the walls of buildings. (SPIRN, 1995, p. 68-69).

Based on urban climatology studies, Danni-Oliveira (2003, p. 157) highlights that residential areas surrounded by green spaces receive less “incidence of solar radiation”, through “exchanges of heat and humidity flows, as well as the dispersion of pollutants”.

For this reason, the recognition of green areas present in the urban fabric reiterates the importance of adopting principles dedicated to preservation and conservation, as a necessary condition for the construction of urban sustainability, which can interfere favorably not only in improving environmental quality, but mainly in the quality of urban life. For this question, the studies developed by Diegues (1996) show that the simple presence or implementation of green areas in cities requires the recognition and appreciation of the local population, so that it appropriates its environments by enjoying and contributing to its care and maintenance. Within the scope of the question, the alternatives that may emerge from the conception of landscape ecology gain importance insofar as they constitute the essence of the principles that guide the “planning and design of the urban and regional landscape, offering efficient mechanisms to be used in the collection of data. data, analysis, diagnosis and interpretation of data” (ROSIN, 2019, p.03). For this author, this process, above all, implies incorporating “sustainability as a backbone” from the recognition of the landscape “as a historical landmark in an incessant state of transformation, resulting from its natural interactions or resulting from human action that can act in a different way. to guarantee the balance of ecosystems” in accordance with the conditions necessary to promote the environmental quality of urban green spaces.

Metodology

For the theoretical-methodological approach adopted, it was adequate to delineate the research by a qualitative approach, in which the procedures had a logical basis that consisted

of the investigation organized in three phases: "open or exploratory", "data collection" and "analysis". and systematic interpretation of data" (LÜDKE; ANDRÉ, 1986, p. 21).

In its first phase, the research was called - open or exploratory, elaborated from the specific literature, through consultation in books, theses, dissertations, articles, etc. on the subject, with repetition of bibliographic references, without the presentation of new propositions that would expand the theoretical discussion.

In the second phase, the research carried out the collection of data and information in loco (carried out in 2019 and tabulation in 2020), which were worked from the cartographic base of the Municipality of Cuiabá and data from the IBGE (2010), with theoretical input from the studies undertaken by Angelis, Castro and Angelis Neto (2004), Santiago, Santiago and Soares (2016), as well as, in NBR 9050/2015, in order to select the methodological procedures relevant to the subject under study.

In its last phase, the research made the introduction of the research object within a framework of theoretical references, concomitantly with the field studies, aiming to reach the products of this investigation.

Procedures for evaluating UPGSs

From the records of implementation of UPGSs in the neighborhood, it was necessary to choose requirements such as categories of analysis: accessibility, vegetation, quantity and quality of furniture implemented and the provision of public services. Likewise, for the development of empirical research, pre-established attributes and variables were considered, intending to:

a) to assess the quality of accessibility in UPGSs, considering the state of conservation of the floor, the existence and dimensioning of circulation routes, natural barriers that could compromise accessibility, the offer of a ramp and tactile floor for alerting and directing, as well as the offer of parking, including for the elderly (Chart 1):

Chart 1

Assigning weight (value) to accessibility in UPGSs

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Accessibility	State of conservation of the floor in space (UPGS)	good	2
		reasonable	1
		bad	0
	Circulation routes are less than 1.20 meters	yes	0
		no	2
	Existence of at least one accessible route within the space (UPGS)	yes	2
		no	0
	Space vegetation (UPGS) interrupts the accessible route	yes	0
		no	2
	It has access ramp	yes	2
		no	0
	It has tactile warning and directional floor	yes	2
		no	0
	In the surroundings of the space (UPGS) there are spaces reserved for people with disabilities	yes	2
		no	0
	There are spaces reserved for the elderly Around the square (UPGS)	yes	2
		no	0
	Parking	yes	2
		no	0

Source: BENINI (2020).

b) the quality of the "vegetation" attribute was measured, based on the criteria: offer of wooded spaces and undergrowth, presence of landscape treatment, as well as the percentage of permeability in UPGSs (Chart 2):

Chart 2

Assignment of weight (value) to vegetation in UPGS

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Vegetation	The space is wooded	yes	3
		no	0
	The space has undergrowth	yes	3
		no	0
	The space is landscaped	yes	3
		no	0
	Permeability (%)	greater than 75%	3
		from 50 to 75%	2
		from 25 to 49%	1
		less than 25%	0

Source: BENINI (2020).

c) To assess the quality of furniture intended for recreation, the offer of a playground, exercise equipment (outdoor gym), fitness equipment for seniors, as well as the existence of a sports court were considered (Chart 3).

Chart 3

Assignment of weight (value) to furniture intended for leisure at UPGS

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Furniture intended for recreation	Playground	yes	3
		no	0
	Exercise equipment – Outdoor gym	yes	3
		no	0
	Fitness equipment for seniors	yes	3
		no	0
	Sports court	yes	3
		no	0

Source: BENINI (2020).

d) among the attributes evaluated, for the cultural dimension, the installation of a stage for artistic performances, fountain and water mirror and exhibition of works of art, such as sculptures, busts, among others (Chart 4):

Chart 4

Assignment of weight (value) to furniture intended for culture at UPGS

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Culture	Stage	yes	2
		no	0
	Work of art	yes	2
		no	0
	Fountain / water mirror	yes	2
		no	0

Source: BENINI (2020).

e) quality of furniture in general, the value/weight assigned to each variable in Chart 5 was considered, in order to allow a systematic analysis of UPGSs:

Chart 5

Assignment of weight (value) to securities in general at UPGS

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Furniture in general	Banches	yes	3
		no	0
	Fountain	yes	3
		no	0
	High lighting	yes	3
		no	0
	Low lighting	yes	3
		no	0
	Trash can	yes	3
		no	0
	Restrooms	yes	2
		no	0
	Bus stop	yes	1
		no	0
	Taxi rank	yes	1
		no	0
	Newsstand	sim	1
		não	0
	Public telephone	yes	1
		no	0
	Kiosk	yes	1
		no	0

Source: BENINI (2020).

f) Furthermore, the research contemplated the evaluation of the public services offered in the UPGS s, such as conservation, maintenance and cleaning of the space. At this stage, the provision of security (watchman) on site was also considered (Chart 6):

Chart 6

Assignment of weight (value) to the public service offer at UPGS

ATTRIBUTE	VARIABLES	SITUATION	WEIGHT
Public service	Space conservation	good	2
		reasonable	1
		bad	0
	Space cleaning.	good	2
		reasonable	1
		bad	0
	Security (watchman) on site	yes	1
		no	0

Source: BENINI (2020).

The study of such attributes in arrangements, based on their categories, allowed the elaboration of tables and maps, which contributed to assess the quality of UPGSs, and in a

later phase the Urbanized Public Green Area Index (UPGSI) by neighborhood of the east zone of the city of Cuiabá, through data interpolation in the following formula:

UPGSI = Urbanized Public Green Area Index by neighborhood
∑ { Urbanized PGS : inhab } = UPGSI (m²/inhab)

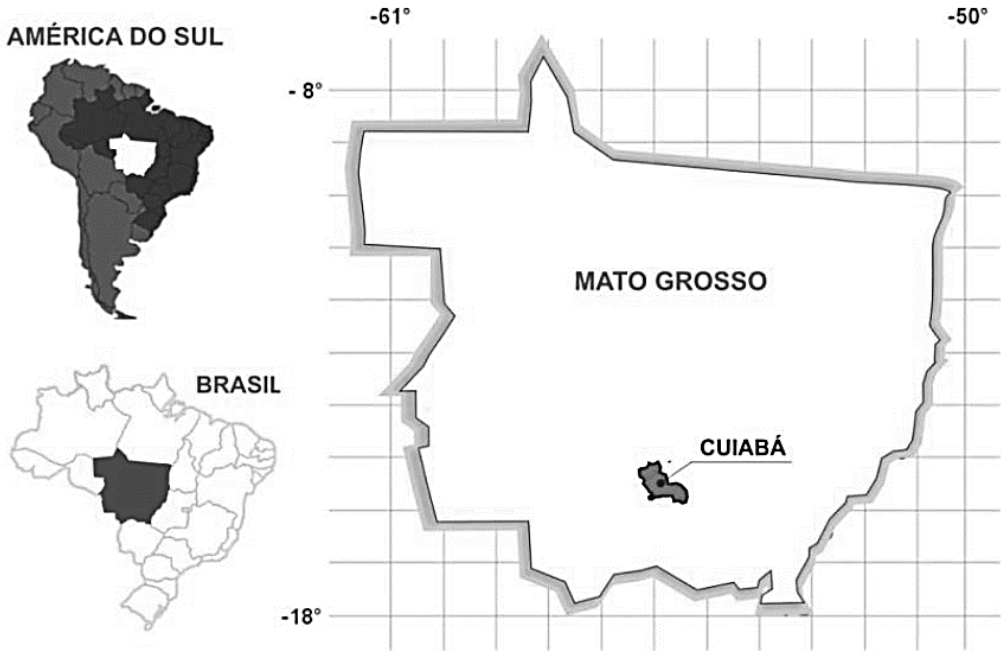
For these questions, the methodology adopted, in addition to meeting the proposed objective, can be used for a study to assess the UPGSIs in other regions of the city of Cuiabá, as well as in other Brazilian cities.

Case study

The city of Cuiabá-MT is located in the geomorphological province called Baixada Cuiabana, between the geographic coordinates 15° 35' and 56" of south latitude and 56° 06' and 01" of longitude W of Greenwich, State of Mato Grosso (Figure 1). Its territory covers an area of 3,538.17 km², corresponding to 254.57 km² for the urban area and 3,283.60 km² for the rural area. It borders the municipalities of Acorizal, Rosário Oeste, Chapada dos Guimarães, Santo Antônio do Leverger and Várzea Grande.

Figure 1

Location of Cuiabá-MT



Source: Ávila (2015, p. 4).

The site has topographical features with slightly undulating reliefs at low altitudes, ranging from 146 to 250 meters, whose main drainage course is the Cuiabá River. According to Ávila (2015, p. 4), in the region there is a predominance of a “Continental Tropical climate, without maritime influence, where the interference of urban land use in the occurrence of heat islands has already been detected”, the region “has a low frequency and average wind speed, which makes the influence of the built space on the air temperature more noticeable, since the thermal exchanges by convection are minimized", thus, there is a predominance of high temperatures, with rain in the summer and winter with dry weather.

Cuiabá is home to 118 neighborhoods in its spatial arrangement, distributed in four administrative regions: north, south, east and west.

Data from the IBGE Census (2010) indicated that 136,596 people were residents of the east side of the city of Cuiabá (Table 5), however, it is observed that only 86,464 people (Table 1) live in neighborhoods with urbanized public green areas, among which are the squares, gardens and urban parks, aimed at recreational and leisure practices.

Table 1

Population (children and adolescents) of the east zone of the city of Cuiabá-MT

Cd.	NEIGHBORHOOD OF THE EAST ZONE	POPULATION[(1)]	AGE GROUPS (%)			
			0 a 4	5 a 9	10 a 14	16 a 19
36	Planalto	5.202	8,98	8,27	8,82	9,02
39	Sol Nascente	2.106	7,79	8,36	8,55	10,64
41	Residencial São Carlos	2.561	6,21	6,99	8,67	8,55
43	Residencial Santa Inês	2.161	6,11	5,46	6,25	9,16
45	Bela Vista	3.276	7,66	7,72	7,66	9,86
47	Terra Nova	2.701	6,29	4,52	6,52	8,81
52	Baú	2.099	4,91	4,57	5,43	7,53
53	Da Lixeira	4.420	5,23	6,18	7,22	8,08
54	Dos Bandeirantes	985	4,06	5,08	6,19	8,12
55	Do Areão	5.533	6,83	6,14	6,58	7,97
57	Pedregal	6.279	7,25	7,01	8,81	8,41
58	Jardim Itália	5.815	7,17	8,62	10,03	9,15
62	Jardim Imperial	5.738	6,92	8,23	8,77	9,57
65	Boa Esperança	5.751	4,43	4,45	4,54	7,51
66	UFMT	141	2,84	1,42	4,96	12,77
67	Jardim das Américas	3.851	4,73	4,18	5,51	8,34
69	Do Poção	4.442	5,49	5,52	6,17	8,58
70	Dom Aquino	10.973	6,49	6,61	6,94	8,68
71	Do Terceiro	2.143	8,82	8,63	9,01	10,17
72	Jardim Paulista	2.143	6,30	5,55	6,67	7,19
73	Jardim Europa	1.332	4,74	5,42	7,00	8,43
74	Campo Velho	2.589	5,87	7,07	7,57	8,92
76	Jardim Petropólis	1.488	3,90	4,03	4,23	8,74
78	Praeiro	1.450	7,10	6,34	8,55	9,31
80	Jardim Shangri-Lá	1.285	4,59	4,82	6,23	5,99

Note. [1] - Population according to data collected by the IBGE Census (2010).

Source: IBGE (2010), organized by the authors.

To support the elaboration of this article, the data indicated in the table “Value of average monthly nominal income of people with income, responsible for permanent private households, according to neighborhoods” from IBGE (2010) were applied, as specified in table 2:

Table 2

Average income

CLASS	LIMIT
Low Income	Below 2,91 S.M.
Lower Middle Income	From 2,91 S.M. to 5,65 S.M.
Average Income	From 5,66 S.M. to 11,65 S.M.
Upper Middle Income	From 11,66 S.M. to 21,94 S.M.
High Income	Above 21,94 S.M.

Source: IBGE (2010).

The economic data related to the average income of the population in this locality allow us to observe that only the Planalto, Sol Nascente, Bela Vista and Do Terceiro neighborhoods fit into the socioeconomic profile - lower class, which requires special care in matters relating to the social vulnerability of this population..

Table 3

Average income of the population in the east zone of the city of Cuiabá-MT

Cd.	NEIGHBORHOOD OF THE EAST ZONE	POPULATION (1)	AVERAGE INCOME (SM)(2)	CLASS LIMIT
36	Planalto	5.202	2,61	Low Income
39	Sol Nascente	2.106	2,60	Low Income
41	Residencial São Carlos	2.561	4,63	Lower Middle Income
43	Residencial Santa Inês	2.161	5,04	Lower Middle Income
45	Bela Vista	3.276	2,81	Low Income
47	Terra Nova	2.701	11,87	Upper Middle Income
52	Baú	2.099	12,01	Upper Middle Income
53	Da Lixeira	4.420	5,37	Lower Middle Income
54	Dos Bandeirantes	985	20,90	Upper Middle Income
55	Do Areão	5.533	7,34	Average Income
57	Pedregal	6.279	3,27	Lower Middle Income
58	Jardim Itália	5.815	13,24	Upper Middle Income
62	Jardim Imperial	5.738	6,05	Average Income
65	Boa Esperança	5.751	21,54	Upper Middle Income
66	UFMT	141	20,98	Upper Middle Income
67	Jardim das Américas	3.851	31,96	High Income
69	Do Poção	4.442	7,29	Average Income
70	Dom Aquino	10.973	5,73	Average Income
71	Do Terceiro	2.143	2,71	Low Income
72	Jardim Paulista	2.143	5,98	Average Income
73	Jardim Europa	1.332	11,54	Average Income
74	Campo Velho	2.589	3,94	Lower Middle Income
76	Jardim Petropólis	1.488	20,29	Upper Middle Income
78	Praeiro	1.450	3,62	Lower Middle Income
80	Jardim Shangri-Lá	1.285	30,67	High Income

Note. [1] - Population according to data collected by the IBGE Census (2010); [2] - Average Income (SM) - as a basis for this work, the data from the table "Value of the average monthly nominal income, value of the median monthly nominal income of people with income, responsible for permanent private households, according to the neighborhoods" of the Demographic Census 2000 (results from the universe), published by the IBGE.
Source: IBGE (2010), organized by the authors.

Results

During the elaboration of this study, it was possible to notice the deficiency of UPGSs in the east side of the city of Cuiabá, demonstrating the non-compliance with the requirements established by the Land Installment Law (Law 6.766/1979), in particular, the content of its article 22, for which, urban equipment (roads and squares, open spaces and areas destined for public buildings and other urban equipment), after registration of the subdivision, become part of public domain assets.

Although the idea of insufficient financial resources for Public Administrations to meet urban demands related to health, education, social services, among others, is recurrent, it

does not justify the low supply of such equipment found in this location, in view of the numerous alternatives of urban design that allow deployments at lower costs and suited to the needs of each region.

Table 4

Synthesis of the qualitative evaluation of UPGS s in the east zone of the city of Cuiabá-MT

Cd.	NEIGHBORHOOD OF THE EAST ZONE	URBANIZED PUBLIC GREEN AREA	M²	QUALITY(1)	AVERAGE Q.(2)
36	Planalto	Praça Planalto I	694,29	22	16
		Praça Planalto II	4.178,26	30	
39	Sol Nascente	Praça do Sol Nascente	245	20	20
41	Residencial São Carlos	Praça Residencial São Carlos	8159,79	31	31
43	Residencial Santa Inês	Praça Santa Inês	6446,07	25	25
45	Bela Vista	Parque da Família	27.931,31	43	28
		Praça Residencial Mirante de Cuiabá	1.688,96	13	
47	Terra Nova	Praça Terra Nova	10.028,19	37	37
52	Baú	Praça Teodoro Paulino do Espírito Danto	2108	20	24,33
		Praça Mãe Preta	218	34	
		Praça Dona Rosinha Galvão	170	19	
53	Da Lixeira	Praça Dona Palmira Pereira Lima	13.742	35	26,8
		Praça dos Bandeirantes	3.803	36	
		Praça Jaime Miguel de Figueiredo	1.853	17	
		Praça do Rosário	6.131	33	
		Praça Francisco Morais de Oliveira	2.665,22	13	
54	Dos Bandeirantes	Praça May do Couto	461	29	29
55	Do Areão	Praça Assis Chateaubriand	682,23	23	23
57	Pedregal	Mini Estádio	10.546,51	36	36
58	Jardim Itália	Parque Tia Nair	91.672	63	63
62	Jardim Imperial	Praça Canir Ananias Pinto Paraná	2.500	28	31
		Praça Jardim Imperial	2.500	34	
65	Boa Esperança	Praça Oscar Amelito / Praça do Chalé	982,84	24	24,4
		Praça São Benedito	407,95	34	
		Praça da Paz	8.162,94	20	
		Praça Nazi Bucair	913,36	21	
		Praça Edgar Vieira	4.566,96	23	
66	UFMT	Praça do Restaurante Universitário	7.741,18	48	48
67	Jardim das	Sem Denominação	4.437	43	35,66

	Américas	Praça do Bispo	5.598	40	
		Praça da Padaria América	15.833	24	
69	Do Poção	Praça do Poção Centro Comunitário	5.064,62	26	26
70	Dom Aquino	Praça Maria Taquara	926	38	27,63
		Praça Bispo Dom José	1487	31	
		Praça Do Seminário	74,7	8	
		Praça João Batista De Almeida	1.862	13	
		Praça Isabel Abelen Santana	3.314	22	
		Praça Ana Poupina	4.545	18	
		Praça Severino Bispo De Arruda	4.100	32	
		Praça Clovis Hgney	1.655	23	
		Praça Nossa Senhora Auxiliadora	435	39	
		Praça Gonçalo de Almeida Botelo	2.144	48	
		Praça Oscar Soares	666	32	
71	Do Terceiro	Praça da Igreja	8.184,64	26	26
72	Jardim Paulista	Praça Vereda Tropical	1.414,8	15	15
73	Jardim Europa	Praça dos Eucaliptos	4.382	26	27,66
		Sem Denominação	2.759	30	
		Praça Cleber de Oliveira Florêncio	2.524	27	
74	Campo Velho	Praça Norberto Schantes	940	39	39
76	Jardim Petropólis	Praça Dr. Alex de Moura Morelli	3.774	34	34
78	Praeiro	Praça Marozon B. Borges	96	10	10
80	Jardim Shangri-Lá	Praça dos Navegantes	3.675	33	25,5
		Praça Totó Pães	3.975	30	
		Sem Denominação	2.230	18	
		Praça da Concórdia	1.740	33	
		Praça Coronel Meirelle	3.924	10	
		Praça Rosa Cruz	7.260	29	

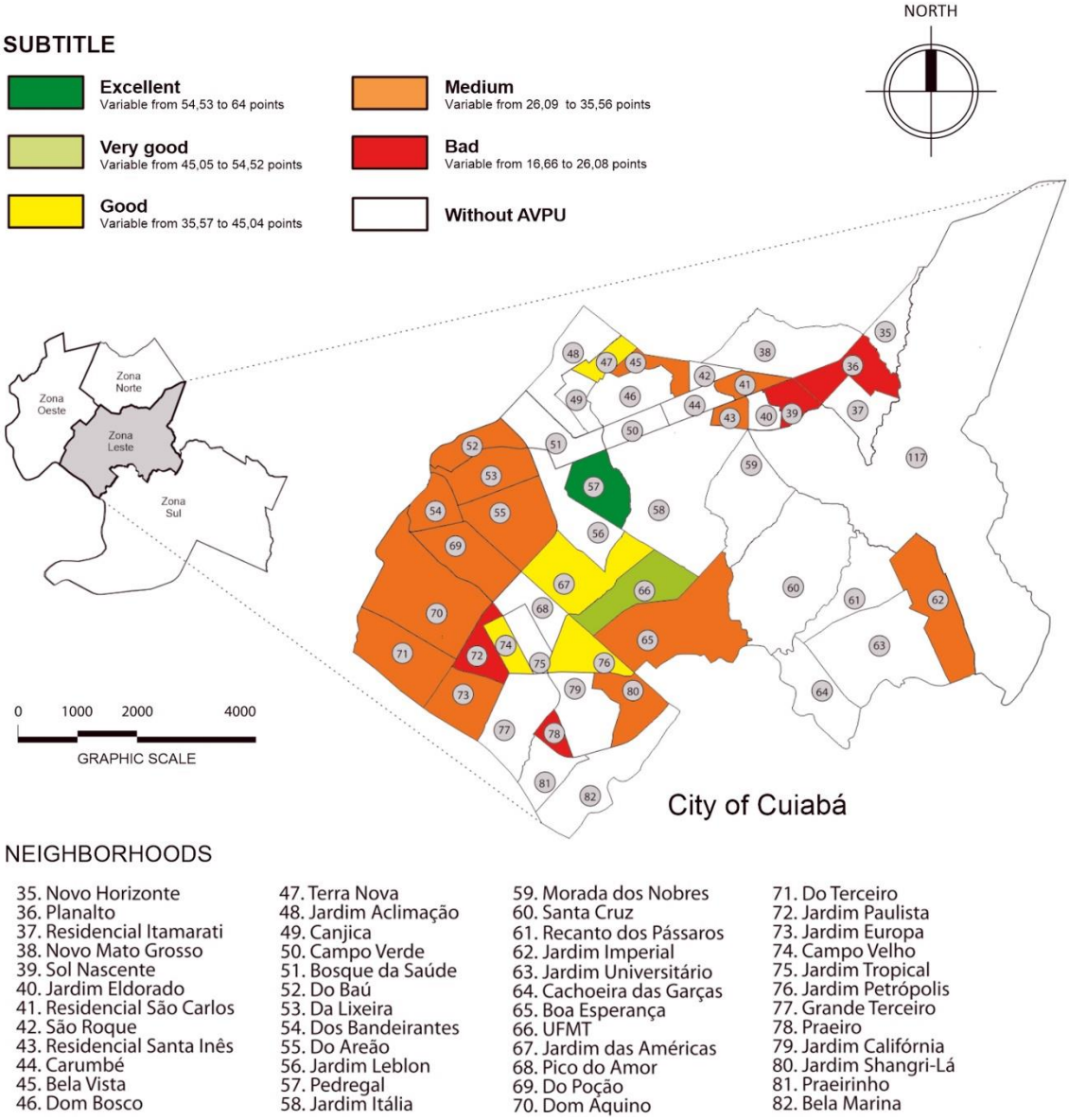
Note. [1] - Quality of UPGS - Urbanized Public Green Area (squares, gardens and parks); 2 - Average quality measured by neighborhood.
Source: IBGE (2010), organized by the authors.

Another aspect found in the results obtained by the qualitative analysis of UPGSs showed that a significant portion of these spaces present precariousness in the supply and maintenance of furniture for qualified use of their activities and appropriation.

Figure 2 shows the contradiction present in the implementation of public policies aimed at leisure and recreation practices in the region, because where the population has lower income and greater needs, the quality of UPGSs is low/restricted, as in the Planalto and Sol Nascente neighborhoods.

Figure 2

Map of the Quality Assessment of UPGS in the east zone of the city of Cuiabá-MT



Source: Prepared by the authors.

Table 5 presents the Urbanized Green Area Index (UPGSI), which is based on the UPGS offer for each inhabitant of the neighborhood. For the United Nations (UN), the recommended ideal fraction consists of "12 square meters of green area per inhabitant so that there is a balance between the amount of oxygen and carbon dioxide", which will be adopted as a reference parameter for this analysis. (BENINI, 2009)

Table 5

UPGSI of the east zone of the city of Cuiabá-MT

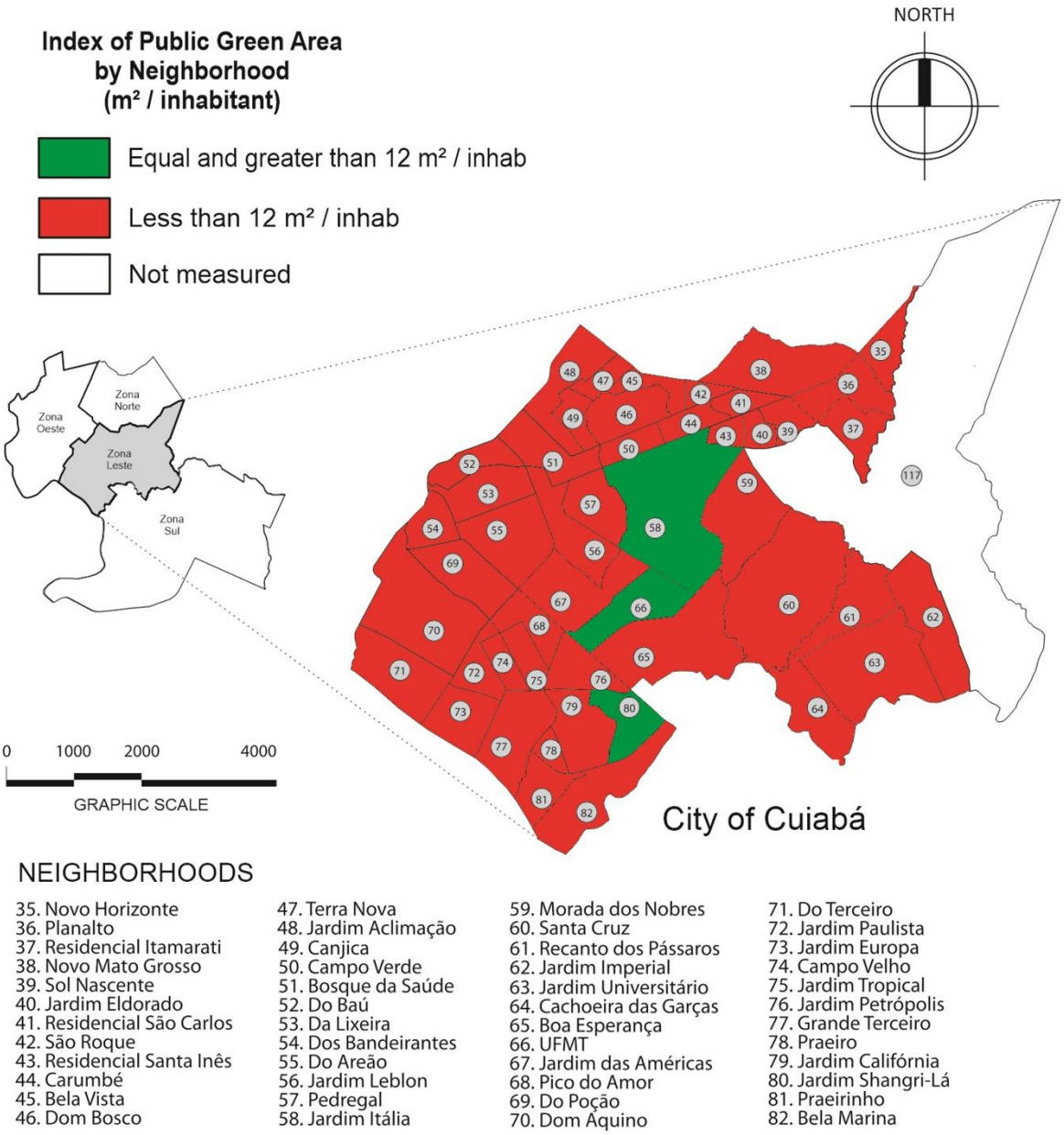
Cd.	NEIGHBORHOOD OF THE EAST ZONE	POPULATION[1]	UPGS (M2) [2]	UPGSI[3]
35	Novo Horizonte	2.951	0	0
36	Planalto	5.202	4.872,55	0,93
37	Residencial Itamarati	2.103	0	0
38	Novo Mato Grosso	2.416	0	0
39	Sol Nascente	2.106	245	0,11
40	Jardim Eldorado	2.392	0	0
41	Residencial São Carlos	2.561	8.159,79	3,18
42	São Roque	557	0	0
43	Residencial Santa Inês	2.161	6.446,07	2,98
44	Carumbé	2.144	0	0
45	Bela Vista	3.276	29.620,27	9,04
46	Dom Bosco	2.780	0	0
47	Terra Nova	2.701	10.028,19	3,71
48	Jardim Aclimação	2.169	0	0
49	Canjica	2.358	0	0
50	Campo Verde	1.845	0	0
51	Bosque da Saúde	4.433	0	0
52	Baú	2.099	2.496	1,18
53	Da Lixeira	4.420	28.194,22	6,37
54	Dos Bandeirantes	985	461	0,46
55	Do Areão	5.533	682,23	0,12
56	Jardim Leblon	3.656	0	0
57	Pedregal	6.279	10.546,51	1,67
58	Jardim Itália	5.815	91.672	15,76
59	Morada dos Nobres	174	0	0
60	Santa Cruz	2.428	0	0
61	Recanto dos Pássaros	2.258	0	0
62	Jardim Imperial	5.738	5.000	0,87
63	Jardim Universitário	2.934	0	0
64	Cachoeira das Garças	39	0	0
65	Boa Esperança	5.751	15.034,05	2,61
66	UFMT	141	7.741,18	54,90
67	Jardim das Américas	3.851	25.868	6,71
68	Pico do Amor	1.956	0	0
69	Do Poção	4.442	5.064,62	1,14
70	Dom Aquino	10.973	21.208,70	1,93
71	Do Terceiro	2.143	8.184,64	3,81
72	Jardim Paulista	2.143	1.414,8	0,66
73	Jardim Europa	1.332	9.665	7,25
74	Campo Velho	2.589	940	0,36
75	Jardim Tropical	1.640	0	0
76	Jardim Petropólis	1.488	3.774	2,53

77	Grande Terceiro	4.577	0	0
78	Praeiro	1.450	96	0,06
79	Jardim Califónia	1.754	0	0
80	Jardim Shangri-Lá	1.285	22.804	17,74
81	Praeirinho	1.951	0	0
82	Bela Mariana	617	0	0
117	Área de Expansão Urbana	-	-	-

Note. [1] - Population according to data collected by the IBGE Census (2010); 2 – UPGS (M2) – Urbanized Public Green Area per square meter; 3 - UPGSI – Índice de Área Verde Pública Urbanizada.
Source: Prepared by the authors.

Figure 3

Map of UPGSI by subdivision in the east zone of the city of Cuiabá-MT



Source: Prepared by the authors.

Thus, the data found allowed the spatialization of the UPGSI in the east of Cuiabá, which are presented in Figure 3. Based on these results, it is possible to infer that, despite the predominance of high temperatures in the region, which would require a greater supply of green areas, most of the studied area has an index below the ideal recommended by the UN, with the exception of Jardim Itália, UFMT and Jardim Shangri-Lá.

Conclusion

This research aimed to develop an analysis to assess the quality of Urbanized Public Green Areas (UPGSs), in their diverse typologies - squares, gardens and urban parks, intended for recreational and leisure practices in the context of the contemporary city. As a spatial clipping of the study, the east zone of the city of Cuiabá-MT was chosen. as well as the quality of these spaces, which denotes, among other factors, the absence of public policies aimed not only at the implementation of new spaces, but also at the urbanization and revitalization of existing green areas in the region.

When measuring the IAVPU, the low rates found can be attributed to the scams historically practiced in the land subdivision processes in the country, with the failure to comply with the required legal dimensions. Therefore, the results pointed to the need to implement new spaces, in compliance with the Land Parceling Law, mainly due to the relevant contribution in the confrontation of the high temperatures characteristic of this region, in view of the environmental and ecological functions performed by the green areas in the middle. urban. In this sense, the importance of the implementation of urban parks is highlighted so that the index of 12 m² of green areas per inhabitant can be reached, in order to contribute to the improvement of the environmental quality of the urban space and, consequently, to the improvement of the quality of population life.

References

Almeida, J. R. de. (2021). Gestão de áreas verdes e sustentabilidade: estudo de caso a partir dos indicadores de qualidade ambiental urbana. *Paisagem e Ambiente, 32*(48), e183164. https://doi.org/10.11606/issn.2359-5361.paam.2021.183164

ANGELIS, Bruno Luiz de; CASTRO, Rosana Miranda de; ANGELIS NETO, G. (2004). Metodologia para levantamento, cadastramento, diagnóstico e avaliação de praça no Brasil. *Engenharia Civil. UM*, n. 20, p. 57-70. Disponível em: http://www.civil.uminho.pt/cec/revista/Num20/Pag%2057-70.pdf. Acesso em: 5 set. 2020.

ÁVILA, Adriano Dias *et al*. (2015). Análise de revestimentos de cobertura do solo em parque urbano na cidade de Cuiabá-MT-Brasil. *ANAIS...* XIII ENCONTRO NACIONAL e IX ENCONTRO LATINO-AMERICANO DE CONFORTO NO AMBIENTE CONSTRUÍDO. Recuperado de

http://www.infohab.org.br/encac/files/2015/topico3artigo07.pdf. Acesso em: 10 abr. 2020.

BENINI, Sandra Medina (2009). *Áreas verdes públicas:* a construção do conceito e a análise geográfica desses espaços no ambiente urbano. 2009. Dissertação (mestrado) - Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista, Presidente Prudente, SP.

BENINI, Sandra Medina (2015). *Infraestrutura verde como prática sustentável para subsidiar a elaboração de planos de drenagem urbana*: estudo de caso da cidade de Tupã/SP. 2015. Tese (doutorado) – Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista, Presidente Prudente, SP.

BENINI, S. M. (2020). Landscape planning of the city of Cuiabá - MT: Case study of urbanized green areas in the Westside. *Revista Nacional De Gerenciamento De Cidades, 8*(67). https://doi.org/10.17271/2318847286720202735

CAVALHEIRO, Felisberto *et al.* (1999). Proposição de terminologia para o verde urbano. *Boletim Informativo Sociedade Brasileira de Arborização Urbana*, Rio de Janeiro, ano VII, n. 3, p. 7, jul./ago./set. 1999

DANNI-OLIVEIRA, Inês Moresco (2003). A cidade de Curitiba e a poluição do ar: Implicações de seus atributos urbanos e geoecológicos na dispersão de poluentes em período de inverno. *In*: MONTEIRO, Carlos Augusto de Figueiredo; MENDOÇA, Francisco (Org.). *Clima urbano*. São Paulo: Contexto. p. 155-172

DIEGUES, A. C. (1996). *O mito moderno da natureza intocada.* São Paulo: Hucitec. 136 p

FALCÓN, Antoni (2007). *Espacios verdes para una ciudad sostenible* – Planificación, proyecto, mantenimiento y gestión. Ed. Gustavo Gili: Barcelona.

GOMES, Marcos Antônio Silvestre (2005). *As praças de Ribeirão Preto-SP*: uma contribuição geográfica ao planejamento e à gestão dos espaços públicos. 2005. 204 f. Dissertação (Mestrado) – Programa de Pós-Graduação em Geografia, Universidade Federal de Uberlândia, Uberlândia, MG.

IBGE – Instituto Brasileiro de Geografia e Estatística. *Censo de 2010*. Recuperado de: http://www.censo2010.ibge.gov.br. Acesso em: 17 jul. 2013.

JESUS, Silva Cristina de; BRAGA, Roberto (2005). Análise espacial das áreas verdes urbanas da estância de águas de São Pedro – SP. *Caminhos da Geografia*, *16*(6), p. 206-224, out. 2005. ISSN: 1678-6343. Recuperado de: http://www.ig.ufu.br/revista/volume16/artigo19_vol16.pdf. Acesso em: 10 set. 2012.

LEITE, Maria Angela Faggin Pereira (1994). *Destruição ou desconstrução?* São Paulo: Hucitec.

LIMA, Ana Maria Liner Pereira *et al*. (1999). Problemas de utilização na conceituação de termos como espaços livres, áreas verdes e correlatos. In: 2º CONGRESSO BRASILEIRO SOBRE ARBORIZAÇÃO URBANA. *ANAIS...* São Luís. p. 539-550.

LOBODA, Carlos Roberto; ANGELIS, Bruno Luiz Domingos de. (2005). Áreas públicas urbanas: conceito, uso e funções. *Ambiência*, Guarapuava-PR, *1*(1), p. 125-139, jan./jun.

LÜDKE, Menga; ANDRÉ, Marli E. D. A. (1986). *Pesquisa em educação*: abordagem qualitativa. São Paulo: EPU. 99 p.

MACEDO, Silvio Soares (1994). *Quadro do paisagismo no Brasil*. São Paulo: [s/e], 1999. 144 p.

MAGNOLI, Miranda Martinelli (1994). Ambiente, espaço, paisagem. *Paisagem e Ambiente* – Ensaios I. 2. ed. São Paulo: FAUUSP.

MAGNOLI, Miranda Martinelli; MACEDO, Silvio Soares (2000). Paisagismo: ensino e pesquisa em pós-graduação. *Revista do Programa de Pós-Graduação da FAUUSP*, São Paulo, *8*, dez.

MILANO, M. S. (1990). Planejamento da arborização urbana: relação entre áreas verdes e ruas arborizadas. In: ENCONTRO BRASILEIRO SOBRE ARBORIZAÇÃO URBANA, 4, 1990. Curitiba*. Anais...* Curitiba: Sociedade Brasileira de Arborização Urbana.

NOGUEIRA, A.; WANTUELFER, G. (2002). *Florestas urbanas*: planejamento para melhoria da qualidade de vida. Viçosa: Aprenda Fácil.

NUCCI, João Carlos. (2008). *Qualidade ambiental e adensamento urbano*: um estudo de ecologia e planejamento da paisagem aplicado ao distrito de Santa Cecília (MSP). 2. ed. Curitiba: O Autor. 150 p.

ROSIN, Jeane Aparecida Rombi de Godoy. (2014). Meio Ambiente e Desenho Urbano: em busca de novas possibilidades para pensar a cidade na contemporaneidade. In: *ANAIS...* III Encontro da Associação Nacional de Pesquisa e Pós-Graduação em Arquitetura e Urbanismo (III - ENANPARQ), 2014, São Paulo. III ENANPARQ - Arquitetura, Cidade e Projeto: uma construção coletiva. p. 1-11.

SANTIAGO, Zilsa Maria Pinto; SANTIAGO, Cibele Queiroz de; SOARES, Thaís Silveira. (2016). Acessibilidade no espaço público: o caso das praças de Fortaleza. *Ergodesign e HCI*, Rio de Janeiro-RJ, v. 4, n. 2, p. 32-29.

SILVA, José Afonso (2008). *Direito Urbanístico Brasileiro.* 3. ed. São Paulo: Malheiros Editores.

SPIRN, Anne Whiston (1995). *O jardim de granito*: a natureza no desenho da cidade. Tradução Paulo Renato Mesquita Pellegrino. São Paulo: Edusp. 345 p.

TROPPMAIR, Helmut; GALINA, Márcia Helena (2003). Áreas verdes. *Território & Cidadania*, Rio Claro-SP, ano III, n. 2, jun./dez.