

Contemporary morphological patterns: morphometric analysis of open spaces in different types of urban lots in the city of Uberlândia-MG

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ABSTRACT

The main objective of this study is to explore the influence and reflexes of urban and environmental legislation on the production, configuration, and distribution of urban open spaces. The work is based on the premise that, over the last years, legislation has played an important role in the composition of the urban spatial mosaic, especially regarding the need and obligation of all new lots to reserve, in the lottable land, a minimum percentage of open spaces, understood in this research as the road network, public recreation areas, permanent environmental protection areas, municipal easements and property easements. The object of this observation are the urban lots approved by the city of Uberlândia since 2000, a period in which several factors forced the city to adjust to the new urban development instruments and to the master plan, mainly the city's rapid growth, also a result of the growth of the Brazilian real estate market. We applied the morphometric methodology, using the QGIS software to quantify open space and analyze measurements and rates of the morphological elements based on the legal parameters. The result was the identification of the way open spaces were designed in the analyzed projects, their spatial relations, morphological typology and distribution patterns, uncovering recurring patterns that characterize the landscape of many medium-sized Brazilian cities.

KEYWORDS: Urban Morphology. Morphometrics. Urban legislation.

INTRODUCTION

Laws dictate our life codes in different ways, and when it comes to the subject of "cities", they are essential, though at times questionable (TALEN, 2012). Urban legislation assumes that urban order can and should proceed through codes described by regulations based on percentages, restrictions, coefficients, and other attributes outlined in each law. Order is obviously beneficial to setting up regulations and guarding open spaces, but what can be seen is that it is not always suited for promoting spatial quality, neither is it the main concern of agents that promote urban development.

In the case of urban lots, which are the focus of this work, legislation is comprehensive and its guidelines range from national to municipal, that is, each city adheres to federal law, but must have its own land use laws, as it is the duty of municipalities to provide such regulations. In Uberlândia, Complementary Law No. 523/2011 was replaced by Law No. 632/2017, which provides for the subdivision of land in the city of Uberlândia and its districts, but, for this study, we considered the 2011 legislation due to the period during which this research was conducted. The present analysis is based on the understanding of this legislation and on the elaboration of a comparative quantitative framework to verify how new lots are configured while incorporating the legal norms related to open spaces in their design.

Legislation is understood to be one of the factors responsible for shaping cities (MOUDO, 1997; OLIVEIRA, 2016; SLUDGE, 1993) and for allowing the creation of different types of green, leisure and recreation infrastructure in the urban fabric, thus defining distinct morphological patterns, which are often impoverished by the limitations imposed by the legislation itself and present some legal loopholes that easily manipulated by real estate market actors. According to Talen (2012, p. 46), land use regulations that rules over the length and width of streets produce a significant social effect, and it is essential that legislation mirrors such effects.

Over the recent years, medium-sized Brazilian cities underwent a broad and accelerated transformation of their urban limits, which added innumerable new lots spanning different social strata, several design patterns of design and urban planning indicators. The main question raised in this research is whether the current legislation regarding the lots of the city of Uberlândia is apt to promote urban environmental quality, be it physical, environmental or social, according to some of the contemporary premises outlined for measuring the quality of urban life.

Open Spaces are understood as all urban structures within the urban space that are undeveloped (MACEDO, et. Al., 2009 ; MAGNOLI, 2006). It is important to note that Open-Space System (OSS) is a concept adopted by the QUAPÁ-SEL group to define this important urban structure, and not a legal definition. In countless cities this concept appears under other names, such as green spaces, recreation areas and free areas, among others. Open spaces are understood as the opposite of built spaces, and these two categories of spaces define the configuration of cities.

The urban OSS comprises all the open spaces in a given scalar section, regardless of their size, location, aesthetic or functional qualities and ownership, whether public or private. The notion of OSS necessarily implies relationships of a functional and socio-environmental nature, considering that physically not all open spaces are connected to each other. (QUEIROGA, 2012, pg 75)

In this study, we expand the notion of the set of existing public open spaces that constitute the urban form, going beyond just squares and parks that are commonly understood as the main green structures in municipal plans and laws, but also other categories that provide cities, as well as everyday life, society and the public sphere, with structure.

OBJECTIVES

The main objective of this article is to analyze the reflex of urban legislation in the lots implemented in the city of Uberlândia, Minas Gerais, through a morphometric analysis. To achieve the central objective of this study, we defined different specific goals: reading and interpreting urban and environmental legislation at the federal level and at the municipal level; conducting a qualitative analysis of open spaces in urban lots in Uberlândia; analyzing the open-space systems contained in the new lots; understanding the production, configuration and distribution of open spaces; identifying the typological categories of Open Spaces in medium-sized cities. Based on these objectives, we intend to identify the contemporary morphological patterns most present in these lots in the city of Uberlândia, and how open spaces are treated in the different urban planning models produced in the city.

METHOD

This research is based on the morphometric methodology. It is based on quantitative readings, in this case of the morphological elements outlined by land use laws, to produce a qualitative analysis of urban spaces in Uberlândia. The premise of the research is that, although there is a good amount of open space, spatial quality is low, which is a result of different factors, among which is the feebleness of the legislation. According to Porta et al (2011, p. 15), morphometrics comprise the observation of the evolution of urban form, where visible features believed to have meaning and quantify are selected and their changes over time are measured.

Our starting point was a review of urban and environmental legislation in Uberlândia at different times leading up to the one currently in force, where we verified and systematized the passages related to open spaces. This analysis allowed for the understanding of the allocation requirements for urban lots, which in turn led to the creation of categories for the analysis, in which they were systematized in a comparative table with all the percentages found in the subjects of this review.

These subjects were chosen following an observation of the patterns found in contemporary lots in the city of Uberlândia, in which typologies related to income, construction profile - whether open or closed, horizontal or vertical - were identified. We stipulated that this study would evaluate lots approved from 2000 onwards, considering the City Statute, the new housing programs, and the rise in real estate credit.

The first part of this study was the organization of the lots to be quantitatively analyzed via the QGIS software, in which thematic maps were produced, thus enabling a quantification and systematization of the spatial categories described in the current urban legislation. This review allowed for the quantification of the different categories of open spaces and their correlation with the percentages required by law. Finally, from the review of these lots, we analyzed the spatial relations found in them.

ANALYSIS AND RESULTS

Legislative powers

The Federal Constitution of 1988 establishes that it is up to the Federal Union to issue general urban planning norms and to institute the national urban plan and macro-regional plans (Art. 21 XX and XXI, and 24, I, and §1); the States are responsible for providing regional urban norms, supplementary to the Union's competence norms, establishing the State's spatial plan and its regional urban plans, which may assume the form of coordinated urban plans for the region (Art. 24, I, and §2);

Municipalities are responsible for their urban development policy, absorbing the duty to fully develop the city's social functions and guarantee the well-being of citizens, as well as promote adequate spatial planning by outlining the use, lotting and occupation of urban land. (Art. 30, VIII). Thus, it is perceived that the authority of the Federal Union, the States and the Municipalities are distinct, as each is assigned its own functions and there is no hierarchy to the laws.

Uberlândia's current Master Plan, in effect since 2006, consists of ambitious development goals and strategies, and provides in Article 2 that: "The Master Plan is the main instrument of Uberlândia's urban and environmental development policy, aimed at guiding the actions taken by the State and by private actors, as well as meeting the aspirations of the community, thus constituting the main normative reference of the relations between the citizen, the institutions and the physical environment."

The complementary legal instruments necessary for the implementation of the development guidelines established in the Master Plan are: I – Land Lotting and Land Zoning and Occupation Law; II - Road System Law; III – Building Code; IV - Municipal Code; V- Tax Code; VI - Environmental Law and VII - Health Code.

Although all these complementary laws are essential for the development of the city, it is imperative to highlight that the Land Lotting and Land Zoning and Occupation Law, the Road System Law and the Environmental Law are, in fact, the normative instruments that determine the configuration of urban space. It is worth mentioning that Municipal Law no. 523 – Land Lotting Law establishes the rules and the allocation of portions of land for roads, property easements, public recreation areas and municipal easements, according to the size of the lot and its nature.

Percentage analysis of Open Spaces in new lots

The lots analyzed represent part of the typological diversity of urban lots produced in recent years in the city of Uberlândia, and it can be said that in many Brazilian cities. They are

all under the same law. However, through measurements obtained via the QGIS software, one can notice some particularities about how the Open Spaces are treated in different contemporary spatial patterns. The categories analyzed for this comparison were: absence or presence of a Permanent Environmental Protection Area (PEPA); percentage of lots; percentage of undeveloped area; percentage of property easements; percentage of municipal easements; percentage of recreation area and percentage of road networks. The categories refer to the items found in Supplementary Law No. 523 of April 7, 2011 on land lotting issued by the municipality of Uberlândia.

We generated comparison charts between the percentages reviewed during the study and those required by law for each land lot. According to the law, the minimum requirements for each lot are: property easements (5%), municipal easements (7%), green/recreation areas (5%) and road networks (20%). There is an exception for the Gávea Sul lot, which was approved under legislation prior to Law No. 523, but its construction started in 2000. The minimum requirements adopted in the law it is under are: property easements (10%), green/recreation areas (7%), municipal easements and road networks (20%).

Figure 1 shows the location of the lots analyzed in the city of Uberlândia. We attempted to select lots in the five sectors of the city, but we could not find new lots that matched the others in the central sector, due to land unavailability, nor in the Northern sector, which is predominantly industrial. The diversity of lots provides a snapshot of the economic scenario and the strong growth of real estate in the city in the period, mainly with the implementation of the Minha Casa Minha Vida (MCMV) program, the launch of new land condominiums and a new planned neighborhood funded by a large local company, Granja Marileusa.

Figure 1: Map of the city of Uberlândia with the analyzed lots highlighted in yellow and parks in green.



Source: AUTHORS, 2017

As an example of the quantitative mapping done in the QGIS software, figure 2 shows Residencial Pequis, a lot installed in Uberlândia by the MCMV program. The categories follow those stipulated by the municipal urban legislation, and the same methodological procedure was applied to the other eighteen real estate projects.

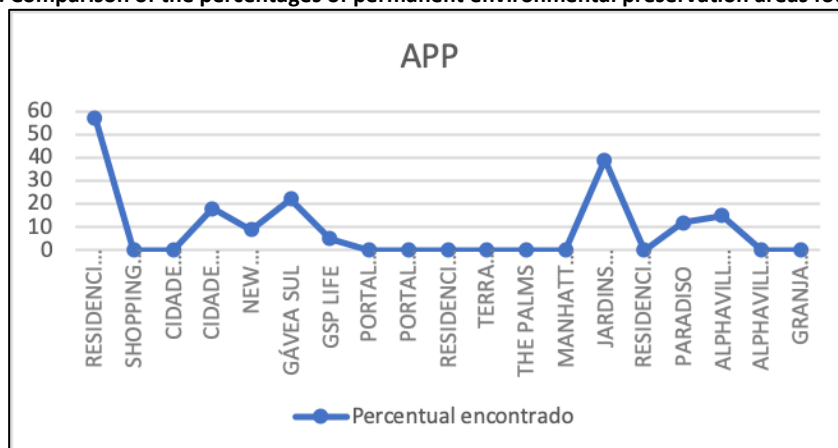
Figure 2: MCMV program's Pequis Lot and percentage graph for each spatial category as defined by law



Source: AUTHORS, 2017

The first category of analysis refers to the presence or absence of PEPAs in the land or next to the lot. From the analysis of the Permanent Environmental Preservation Areas (PEPA) of the lots studied, it is clear that they fit into two different situations (Fig. 3). The first refers to low-income lots, which are located in peripheral regions, where a large part of the permanent environmental preservation areas are located. They are usually arranged next to the recreation areas and can be counted as part of them according to Law No. 523/2011. The second one occurs in some high-income land condominiums, in which PEPAs are within the lot or at its edges. It is noticed that this is as an element that increases the real estate and marketing value of the developments.

Figure 3: Comparison of the percentages of permanent environmental preservation areas found in lots

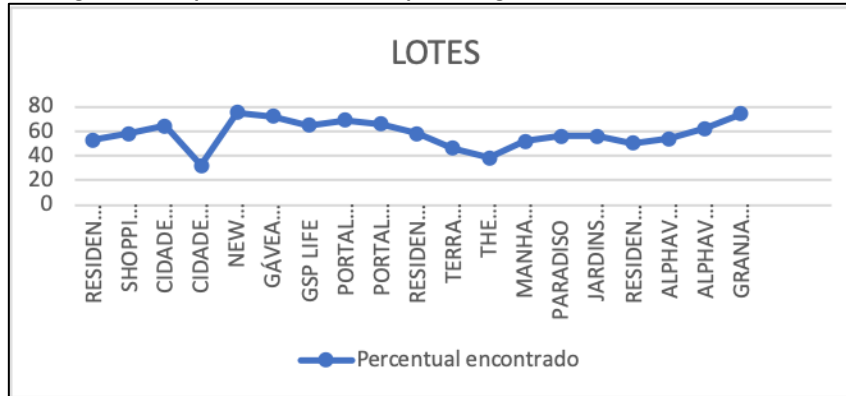


Source: AUTHORS, 2017

In the analysis of the lots we found two factors that caused the difference in the percentages of some lots. It is noticed that the Cidade Verde II lots has the lowest percentage due to the compensation of property easements (Fig. 4) of neighboring plots. Another case is that of lots with large permanent environmental protection areas, which lowers the percentage

of lottable area, since the values are calculated based on total land area (PEPA + undevelopable + lot area).

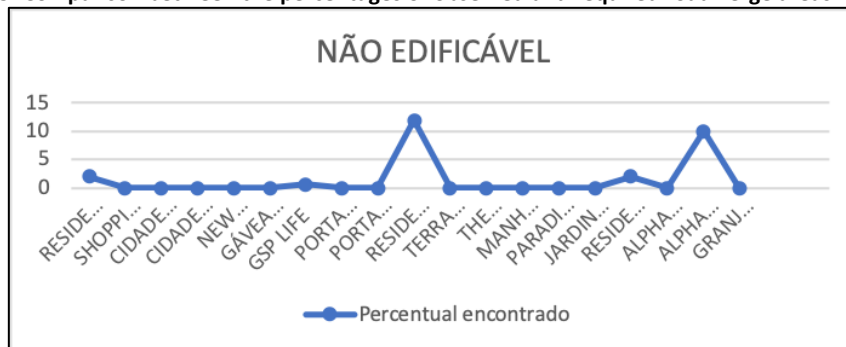
Figure 4: Comparison between the percentages of the lots found in the lots.



Source: AUTHORS, 2017

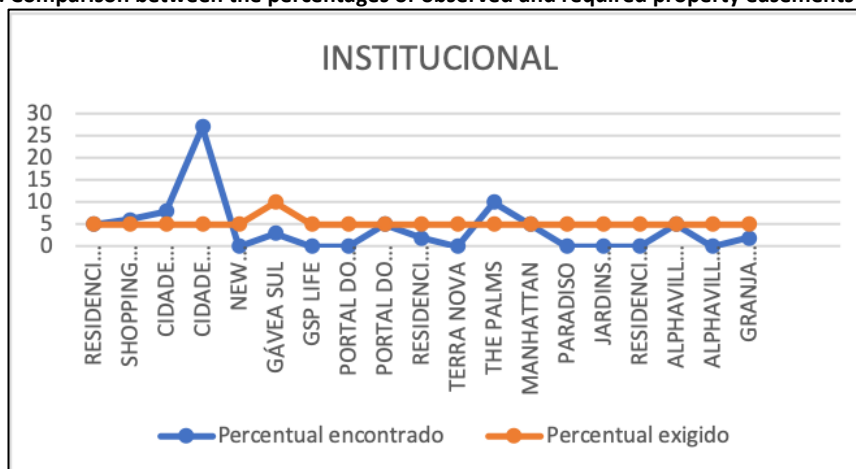
According to Article 4 of Complementary Law No. 523, undevelopable areas are destined for the implantation of infrastructure that cannot be built upon, such as sanitary sewage system, public water supply system and electric power network (Fig. 5). Half of the undevelopable areas can be considered as property easements or public recreation areas, as in the GSP Life and Gávea Sul lots. In the latter, the entire undevelopable area is considered as public recreation to reach the minimum percentage required by law.

Figure 5: Comparison between the percentages of observed and required road verge areas in the lots



Source: AUTHORS, 2017

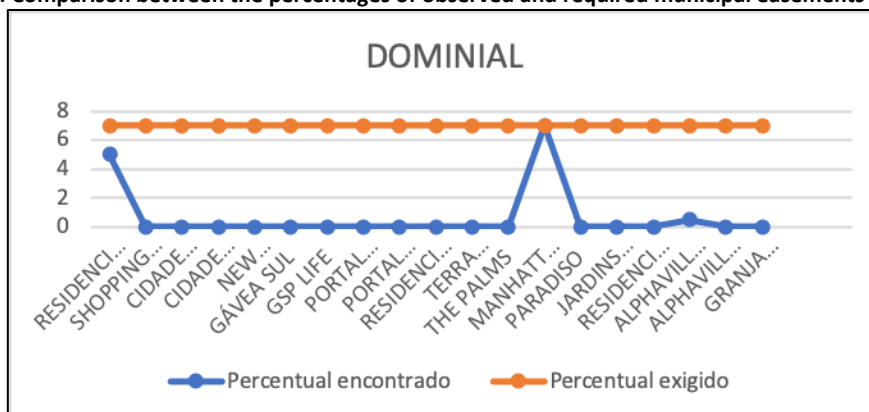
Figura 6: Comparison between the percentages of observed and required property easements in the lots



Source: AUTHORS, 2017

Most low-income lots have property easements within the land that follow the percentages required by law. This is because there is an expectation that these areas may be public schools, health posts, and other public equipment, and due to the lack of such equipment in the peripheral regions where they are allocated (Fig. 6). The percentage in the Green City II residential is above average because there is a compensation for the lack of property easements in other lots and due to the high-density deriving from the projected verticality. We did not find property easements in high-income land condominiums due to the social standard of residents, and the required percentage of property easements was donated to other lots, which underscores the incompatibility between land condominiums and public areas.

Figure 7: Comparison between the percentages of observed and required municipal easements in the lots



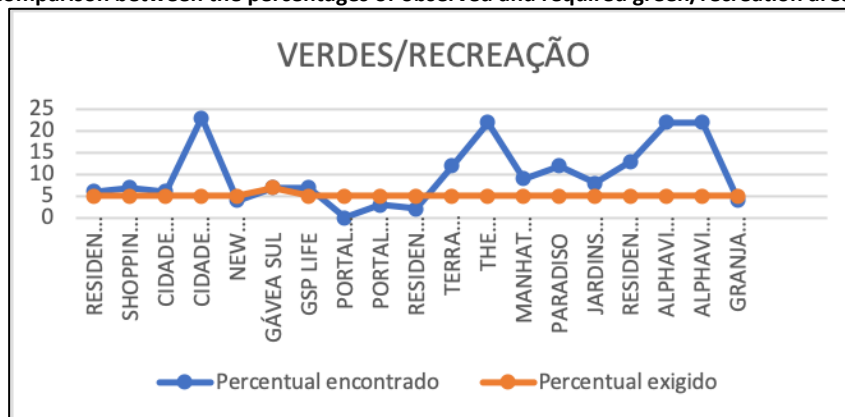
Source: AUTHORS, 2017

In most of the lots analyzed, municipal easements are neglected, as there are no areas allocated for them within the land, due to their being accounted for in other regions. There are still exceptional instances in which the municipal easements are foreseen as the implantation of road networks, as it is the case in the Residential dos Buritis lot (Fig. 7).

As for recreation areas, three unique cases in which the percentage is accounted for were observed (Fig. 8). The first one, which presents a high percentage, occurs in lots where the areas have no connection to the lot or any specific use, for example, The Palms land condominium. The second one, where the percentage is also high, occurs when these lots are part of a Master Plan and intended to compensate for other areas through the implementation

of large green areas, such as Cidade Verde II. The third case involves those that do not reach the minimum percentage required by law and compensate for this in other areas, such as Portal do Vale I and II and Granja Marileusa.

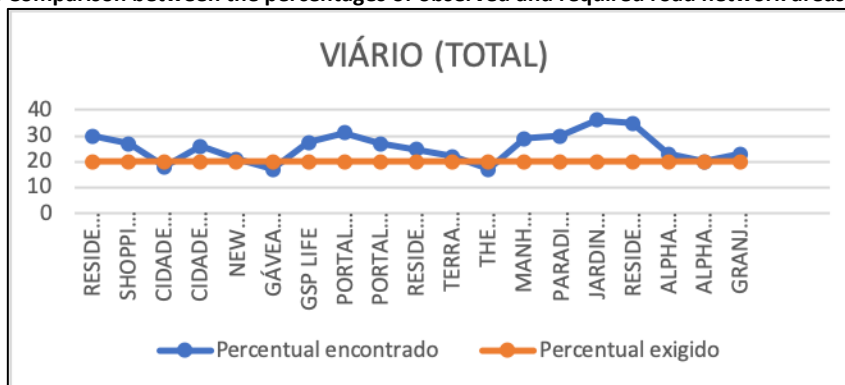
Figure 8: Comparison between the percentages of observed and required green/recreation areas in the lots



Source: AUTHORS, 2017

Some particularities are also worth mentioning, such as the large number of recreation areas without any landscape intervention, which means it is up to the government to implement squares in these locations, but there is no plan for the implementation or management of such areas. In land condominiums lots, the recreation areas are divided into internal and external areas, which are managed by the condominiums, and are generally well-maintained, with a diversity of plant species, urban furniture and other landscape elements, such as fountains and lakes.

Figure 9: Comparison between the percentages of observed and required road network areas in the lots



Source: AUTHORS, 2017

In quantitative terms, Figure 9 shows that the percentage of road network reserves in the lots is rarely related to the income level to which the lot is intended, which only impacts the quality of such spaces. Some, in which percentages are high, have wide sidewalks and even bike lanes, while others add up to a high number due to traffic medians and roundabouts. It is also important to highlight that lots that do not comply with the 20% of road network reserve as required by law, must use the “remaining” land as green and recreation areas.

Results

The quantification of urban elements revealed some particularities and generalities present in these new spaces in the city. As a preliminary result, it is clear that the mere requirement of a reserve percentage by law does not enhance open space as an urban system that is integrated with the local context. It was noticed that there is no correlation between the elements analyzed and they are not regarded as a system either. Conceptually, the streets are the main public space structuring this system. However, we found that the carriageway, sidewalks and traffic medians which form the road network are only designed in a quantitative and bureaucratic manner, with quality only being a concern in areas where the street is not a public space, but a way to replicate the experience of the streets, only in a safe way, with high quality of life standards.

Even though sidewalks are built according to the law, they do not foster an environment where people can walk freely, socialize, or enjoy a scenic landscape complete with urban forestry, since, in addition to their being narrow, there are numerous conflicts between their size and overhead and underground infrastructure elements, as well as a low quality of construction. According to the metrics analyzed, the road network makes up the largest percentage of open spaces of lots, and should be treated as the most important public space of the city.

Recreation areas, a denomination that can be questioned, since it establishes that they should be primarily aimed at recreation, do not allow for other, more suitable uses in certain situations, nor do they contribute to forming a system. A negative aspect is that these areas are not designed as part of a general strategy of the city in a way to contribute significantly to the structuring of a system. Recreation areas, the most visible facet of green areas, can be found in abundance, but are largely distributed as a residual part of lots, such as the corners of the blocks or road intersections.

The green areas do not play a leading role in the design of lots, are not thought of in a systemic way and are poorly connected, with little spatial quality, and many still lacking any architectural intervention. If we look for some historic and even contemporary urban models, we can see that the green areas can define the layout for other morphological elements and thus provide a structure for them. Uberlândia is the mirror of what occurs in many medium-sized Brazilian cities, a result of similar processes and of the trivialization of urban public spaces.

One observation deriving from this study is that, mainly in the case of land condominiums, the absence of a legal restriction for the minimum size of recreation areas enables the excessive fragmentation of these areas into small spaces, usually at the corners of the blocks and next to the walls of the houses. Such small areas are used as flowerbeds, which achieve an aesthetic and visual purpose, but do not play an important structural and systemic role, nor allow for users to establish ownership over them.

Parks complete this category of open spaces subsystems. As some lots are edges of the city, where there are environmental protection areas in the lots, the edges of the PEPAs of are used to implement urban parks, which use the landscape potential and the visibility of access from marginal avenues, which by law are required to contain bicycle paths along the sidewalks. This strategy makes it possible for these parks to concentrate the entire percentage of recreation areas in the lot, making the blocks available for a buildable area, thereby increasing sales profits. The parks are used as a marketing strategy for the developments, since they enjoy good visibility in spatial terms. Positive and negative aspects come from this phenomenon. If on the one hand the installation of an urban park fosters urban and environmental quality, the concentration of green areas hampers their better distribution throughout the lots.

CONCLUSIONS

By means of the quantitative sampling of the morphological elements in the lots analyzed in this study, it is clear that legislation creates a fundamental organization to serve as a parameter for the design of lots, however it is not connected to the different local realities, needs and features. Nor is the legislation in Uberlândia concerned with the different densities provided for by zoning, since the standardization does not distinguish areas with low or high density, and regulations are the same across the entire urban territory. The legal requirements imposed by the land use law are a necessary tool to prevent a lack of control over urban space, but they must be better aligned with the new urban paradigms that are developing both in Brazil and in other countries.

In 2017, the land lotting law specifically changed the subject of this study. The percentage of municipal easement reserves was extinguished and the 7% provided for in the previous law were distributed among the property easements, whose requirement is now 8% and the recreation area reserves, which are now required to reach 9% and are called public green area reserves. This change was the beginning of an understanding of the importance of aiming for a higher percentage of green areas in the urban space.

The absence of systemic thinking impoverishes the legal discussions about the morphological elements as an important structure of the cities. Although open spaces exist in good quantity, the legislation needs to shape some indicators so as to create a stronger connection between the elements that make up the urban space. Open spaces must be understood conceptually and incorporated by urban managers, the Master Plans and especially the actors that build the urban space. Urban managers, developers and building companies should reflect upon such ideas and those who legislate on the urban space should incorporate new legal parameters that increase the qualities of open spaces as a whole, acknowledging the importance of their role in contemporary cities.

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