

Quantitative inventory and analysis of the green areas in Lavras-MG and index evolution ⁽¹⁾

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ABSTRACT

The green area index is one of the parameters used to scale the life's quality of a city. Thus, the objective was to carry out the survey of green area index from Lavras-MG, in two different periods, with an interval of 10 years, making a comparative analysis of the index evolution in this period. It was carried out the assessment of the number of city squares, as well as its area and calculate the green area index. It was considered appropriate for this index, public areas located in urban area and over 70% of the permeable area. For determine this index, it was calculated the sum of the total area of the squares divided by the number of inhabitants of the city. It is concluded that green area index in Lavras-MG is 0.42 m²/inhabitant. There was an increase of 12% compared to the diagnosis realized in 2001, but lower than that proposed by the Brazilian Society for Urban Forestation, 15 m²/inhabitant. **Keywords:** landscaping, parks, squares, life's quality.

RESUMO

Inventário quantitativo e análise da evolução do índice de áreas verdes em Lavras-MG

O índice de áreas verdes é um dos parâmetros utilizados para dimensionar a qualidade de vida de uma cidade. Objetivou-se realizar o levantamento do índice de áreas verdes da cidade de Lavras, MG, em dois períodos diferentes, com intervalo de 10 anos, fazendo uma análise comparativa da evolução desse índice nesse período. Realizou-se o diagnóstico do número de praças da cidade, bem como sua área e cálculo do índice de áreas verdes. Consideraram-se adequadas, para o cálculo desse índice, áreas públicas situadas na malha urbana e com mais de 70% da área permeável. Para a determinação do índice, foi calculada a soma das áreas totais das praças dividida pelo número de habitantes da cidade. Conclui-se que o índice de áreas verdes na cidade de Lavras é de 0,42 m²/habitante. Ocorreu aumento de 12% em relação ao diagnóstico realizado em 2001, mas inferior ao proposto pela Sociedade Brasileira de Arborização Urbana, de 15 m²/habitante.

Palavras-chave: paisagismo, parques, praças, qualidade de vida.

1. INTRODUCTION

Green areas are defined as continuous vegetation sites, free of buildings, even if cut by roads, alleys or with the presence of children's toys and other light entertainment, which are destined for public use (SILVA, 1981 and PAIVA, 2008). Generally they consist of squares and parks, except for urban gardens, which are small areas and whose environmental, ecological, recreational and aesthetic are compromised (SILVA, 1981 and PAIVA, 2008). According to Lardent (1982), green spaces and green areas can be defined as any free space in which predominate planted areas of vegetation, corresponding generally to what is known as parks, gardens and squares.

Squares are free public spaces, open, with an area of 200 m², originated from the basic design of the urban area and usually contemplators and structuring of the road system, with public recreation purposes, from the collective meeting, ornaments and culture (PMBH, 1999).

The green areas correspond to free building spaces category, and their planning aims to meet the demand of the urban community for open spaces that allow recreation,

leisure and nature conservation (MAZZEI, 2007). They are public property, and meets to the objectives as ecological, environmental, recreational and aesthetic (SILVA, 1981). They do not need to be fully geared to leisure, but should provide the opportunity for recreation and leisure to different age groups, through infrastructure and equipment, so that they can be accessible to local residents (SILVA, 1981).

In relation to urban vegetation, Nucci (2001) cites as an important issue the cities' green area index, to which should be considered only public green areas located in urban area and connected to the direct use of the resident population in the vicinity. Often, the estimates of this index are carried out without taking into account the accessibility of the population to green areas, with some areas considered conservation units and located outside the urban area (OLIVEIRA et al., 1999).

Recent research results have demonstrated the importance of the presence of green areas in urban centers. The man's contact with nature promotes numerous benefits in social, cultural, psychological, and environmental ambits, contributing more significantly to quality of life in

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urban centers (ULRICH, 1983; KAPLAN and KAPLAN, 1989; ULRICH et al., 1991; VAN DEN BERG et al. 2007; LAFORTEZZA et al., 2009; CARRUSA et al., 2015).

Thus, the objective of this study was to determine the green area index of the Lavras-MG, analyze the variations occurred in two evaluation periods spaced in 10 years, as well as a comparison with the recommendations by the Brazilian Society for Urban Forestation (SBAU, 1996).

2. MATERIAL AND METHODS

Lavras is located in Campos das Vertentes region of the Minas Gerais State, 21°14'30" south latitude, 44°00'10" west longitude and altitude of 919 meters. The climate, according to Köppen classification is Cwa, rainy temperate (mesothermal) with dry winter and rainy summer, called subtropical (DANTAS et al., 2007). The municipality covers an area of 565 km² (IBGE, 2012), with urban area of 117.84 km and the urban area of 14.16 km².

According to the City Hall of Lavras, there are at least 51 squares in the city (PML 2000). However, according to Paiva (2008) the city had in 2007, 30 (thirty) squares, four of them located in the central area. In relation of parks category, Lavras has the ecological park called Quedas do Rio Bonito, located 9 km from the exit of the city (Industrial District), towards the town of Luminarias, therefore there is no parks in the urban area of the municipality.

It is considered green area with the criterion that the area should be in urban area, be public, offering possibilities for leisure and possess 70% or more of its permeable area (SILVA, 1981). Thus, for the Lavras only the squares were considered. By means quantitative inventory it was possible to determine the number of city squares, as well as their location and total areas. These areas were located by the city map and in the urban area housing developments projects, thus enabling the preparation of a cadastre. In a survey conducted in 2011, the squares were still identified by aerial images of the city, using GoogleEarth 2010 program.

The survey was complemented with fieldwork. The neighborhoods were surveyed using a GPS unit (Global Position System) GARMIN, 60CSx model. Quedas do Rio Bonito Ecological Park areas were not considered, because is situated in rural areas (CARVALHO et al., 2003), private gardens, clubs, central bed and roundabouts. The data were worked in Track Maker GPS program 13.6, in which the squares were identified, its location in the city and the areas calculated (m²) of each one.

The green area index from the Lavras city by the total area sum of squares (m²) divided by the number of inhabitants of the municipality in each evaluation period was calculated.

$$\text{Green Area Index} = \frac{\sum \text{squares' total area}}{\text{number of inhabitants}}$$

3. RESULTS

According to the census of the Geography and Statistics Brazilian Institute of 2010 (IBGE, 2015), Lavras has a population of 92,200 inhabitants. In 2000, according to

IBGE (2001), the population was 78,758 inhabitants, occurring in this period, an increase of 13,442 inhabitants, i.e 14.5%. Based on these data, it can be estimate an increase 2.08% per year. Thus, the population estimated in 2012 was around 96,000 inhabitants, with an increase of 17,242 inhabitants in 12 years.

In quantitative inventory conducted in 2001, it was found the existence of 27 squares in Lavras, totaling an area 52,027.87 m² (Table 1). Of these, only 10 had green area characteristics, according to the criterion by Silva (1981), and amounted at that time, 25,830.33 m².

In the archives of the City Hall of Lavras (PML, 2000) was the record of 51 squares, which included sports centers, roundabouts, cloverleaf intersection and central bed, which did not fit to the concept of green areas considered in this work. Roundabouts, cloverleaf intersection, flower beds and trees of the streets were not considered, because it is part of the green road monitoring, as defined by Silva (1981) and Buccheri Filho and Nucci (2006). In the same concept, the conservation areas, nature reserves were not considered, because they do not offer use as a leisure activity. Also, the square area should be greater than 200 m², and the vegetation must be present in at least 70% of the total area (PMBH, 1999), which characterizes the permeability of space.

By the survey conducted in 2012, it was found the existence of 35 squares in Lavras, but only 24 were classified according to the characteristics of a green area, performing a total area of 40,731.56 m² (Table 1).

In 2001, the Green Area Index for Lavras-MG was 0.33 m²/inhabitant and in 2012 passed to 0.42 m²/inhabitant, increasing in 27.27%, a result of the reform and construction of squares in new neighborhoods in that period. There is no program of the Municipal Administration aiming the construction of green areas.

According to the Brazilian Society for Urban Forestation, this index must be greater than 15 m² per inhabitant (SBAU, 1996), suggesting that the Lavras is deficient in this green areas.

4. DISCUSSION

It is know that the green areas are environmental parameter of life's quality, improvement in the green area index in Lavras as to bring it closer to the ideal, would bring improvements in the population life's quality. The city does not have a park in the urban area, which limits many leisure activities of the population. Parks are places for recreation, leisure and rest, accessible to all social classes and aim to meet the needs of the people to keep in touch with nature (Borem, 2008). As a result of the inexistence of such area, many activities, especially sports and cultural, are normally held on the streets and parking lots.

The urban green area index is dynamic and can be changed over time. In the means that reform or create a square, the index may increase. The reverse can also occur. This justifies the change in number and total area of squares. In 11 years, 8 new squares were made in the city, according to Table 1. It can also be noted that in this period,

Table 1. List of the squares with respective areas and classification or not as green area in Lavras-MG.

Square's name	Localization/ reference	Year 2001 Area (m ²)	Green area	Reason **	Year 2012 Area (m ²)	Green area	Reason **
Dr. Augusto Silva	Downtown	7,507.00	Y		7,507.00	Y	
Sebastião Alcântara	Jardim Europa	5,931.12	Y		5,635.36	Y	
Gilbram Simão	Vale do Sol	4,340.43	N	A	1,092.00	N	
Ouro Preto	Bus station	3,801.04	N	A	-	N	E
Dr. José Esteves	Estação	3,328.58	Y		3,186.00	Y	
José Pedro de Castro	Belizandra	2,979.15	N	A	2,979.15	N	A
Dr. Jorge	Downtown	2,457.24	N	B	2,132.50	Y	
S/D 45	Monte Libano	2,356.07	N	A	2,285.00	Y	
No name III	Downtown	2,136.04	N	A	2,136.04	N	A
Dr. Rafael Menicucci	Jardim Floresta	2,129.49	Y		2,050.00	Y	
Leonardo Venerando	Downtown	1,706.52	Y		2,082.00	Y	
Floriano Inácio de Jesus	Lavrinhas	1,597.44	Y		1,311.00	Y	
No name IV	Cruz Vermelha	1,494.43	N	C	1,494.43	N	C
Mons. Domingos Pinheiro	Downtown	1,314.75	Y		1,313.00	Y	
S/D	Água Limpa	1,199.89	N	A	1,199.89	N	A
Antônio Vilela de Andrade	Jardim Glória	1,144.77	Y		1,177.00	Y	
Juca da Serra	Nova Lavras	1,031.88	N	C	1,045.00	Y	
Maurício O. Souza	Santa Filomena	953.17	N	A	953.17	N	A
Ten. Francisco Souza Lima	Jardim das Palmeiras	732.23	N	D	579.00	Y	
D. Josefina	Downtown	671.98	N		531.00	Y	
Rafael V. Pereira	Vila Vera Cruz	569.47	N	C	569.47	N	A
Governadores	Vale do Sol	509.53	N	B	360.00	Y	
Duque da Rocha	D. Julieta	508.91	N	B	508.91	N	B
Gil Serra Negra	Padre Dehon	498.68	Y		497.00	Y	
Pedro da Várzea	Lavrinhas	457.41	N	B	457.41	N	B
São Pedro	Jardim Europa	419.21	N	B	437.17	Y	
São Vicente	Joaquim Sales	251.44	N	A	-	N	E
Elba Terra	Nova Lavras	-	N	F	200.00	Y	
John Wheeloock	UFLA	-	N	F	2,015.00	N	C, D
No name I (São Sebastião Church)	Arthur Bernardes	-	N	C	1,495.00	Y	
No name II	Martins	-	N	F	925.32	Y	
No name V	Caminho das Águas	-	N	F	2,996.72	Y	
No name VI	Cohab	-	N	F	603.32	Y	
No name VII	Downtown (near the cemetery)	-	N	F	829.17	Y	
No name VIII	Downtown	-	N	F	462.00	Y	
Total area		52,027.87			53,062.03		
Area used to calculate the Green Area Index		25,830.33			40,731.56		
Population		78,758			96,000*		
Green Area Index (m ² / inhabitants)		0.33			0.42		

* estimated

** Criteria used for not classify the square as a green area: A: no physical/plant structure; B: waterproofed; C: No maintenance; D: do not offers leisure; E: area occupied by construction of houses, buildings or other; F: non-existent

many areas received improvement and maintenance, which allowed them to be considered as green areas, while in 2001 only 10 areas had conditions that met the green area criteria, as Silva (1981); in 2012, 24 areas could be included in this classification. Even so, the green area index is quite low. By comparison, in a survey conducted in Vinhedo-SP it was founded 2.19 m² of green area per inhabitant (Harder et al., (2006). In others cities as Jatai-GO, this index is 5.31 m²/inhabitant (SOUZA et al., 2014). In Juiz de Fora, a city situated also in Minas Gerais state, that was founded 24 urban areas performing a green area index of 2.5 m² per inhabitant in 2009 (COSTA and FERREIRA, 2009). Besides of these, all index are lower that the ideal of 15 m²/inhabitant (SBAU, 1996).

Nucci (2001) concludes that only 26.9 km² of 900 km² of urbanized area of São Paulo, are public green areas (squares and public parks), with a green area index 2.9 m²/inhabitant. In Águas de São Pedro-SP, for example, the green area index is 932.09 m²/inhabitant. This high value is due to the small population of the city, and it is a resort town. The municipality has urbanization projects which aims large area to parks and forests (JESUS and BRAGA, 2005). In Sorocaba-SP, the index of green areas is also very high, with an average of 104.6 m²/inhabitant, however, some areas of the city as the one in the center, showed terrible conditions (BRESSANE et al., 2015). Similar green areas index was found in Paulinia-SP, of 96.32m²/inhabitant (BARGOS and MATIAS, 2012).

It is important to consider that there is no consensus on the definition of green areas. As a result, authors use different methodologies for calculating the green area index, making it difficult to compare the data obtained in different Brazilian cities.

In Lavras, even if all the areas considered squares presented satisfactory characteristics to be included in this index, the value would be 0.55 m²/inhabitant, much lower than recommended. Impresses verify this index is lower than São Paulo City (2.9 m²/inhabitant), as defined by Nucci (2001). Aggravates this situation the fact that in this period, two areas (Bus station Square and São Vicente Square) were used for buildings, and the city had lost 4,052.48 m² (Table 1).

In order to meet the recommendations of the Brazilian Society for Urban Forestation 15m² per inhabitant, Lavras, for an estimated population of 96,000 inhabitants in 2012, should have 1,440,000 m² of green area, which would only be possible with the construction of parks in the urban area. Whereas, considering that the city has 566,100,000 m², must would be intended 0.25% of this total area for the green areas construction.

5. CONCLUSION

The green area index in Lavras is 0.42 m²/inhabitant. This index increased in relation to the analyze performed in 2001, but is much lower than proposed by the Brazilian Society for Urban Forestation that is 15 m²/inhabitant.

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