CHAPTER
9

Bibliographic research on urban green areas and their influence on the quality of life of the population

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ABSTRACT
The accelerated and disorderly growth of cities associated with lack of planning brings with it the absence of tree individuals on roads and public places, which causes several impacts (e.g.: changes to the urban microclimate), which negatively influence the quality of life of the inhabitants, resulting in a disharmonious relationship between man and the natural environment (LONDE; Mendes, 2014; MAIA et al., 2018).

Keywords: Urban green areas, Quality of life, Environment.

1 INTRODUCTION

The accelerated and disorderly growth of cities associated with lack of planning brings with it the absence of tree individuals on roads and public places, which causes several impacts (e.g.: changes to the urban microclimate), which negatively influence the quality of life of the inhabitants, resulting in a disharmonious relationship between man and the natural environment (LONDE; MENDES, 2014; MAIA et al., 2018).

This disharmonious relationship, between sustainable development and environmental problems, becomes harmful to public health, especially regarding the increase of carbon dioxide (CO_2), since, for the creation of urban centers, deforestation of green areas occurs and, in their place, industrial and agricultural production areas are installed that leverage economic growth (BRESSANE et al. 2016; SCHEUER; NEVES, 2016).

As for this transformation, in addition to the gaseous release, Oliveira Filho et al. (2013) synthesized that it is directly related to the higher incidence of long-wave solar radiation (> 700 nm), heat absorption in paved areas (cementitious or asphalt), with a consequent tendency to increase temperature, decrease in relative humidity, direct modification of winds, changes in precipitation cycles, heat islands, soil sealing, among others, and that cause changes in the environmental comfort of the community.

To control these changes and improvements of that comfort, one of the medium and short-term solutions is the insertion of vegetation, rapid growth, and thick canopies, with basal areas that cause great shadows that, in large urban centers represent an essential element for adequate environmental comfort, in addition to influencing improvements in microclimatic stability, air purification, due to the fixation of dust and/or toxic gases, temperature reduction, reduction of direct insolation, as it performs the recycling of gases through photosynthetic mechanisms, among other benefits (AMATO-LORENÇO et al., 2016; BARRETO et al, 2019).

Regarding urban afforestation, studies already published (BARGOS; MATTHIAS, 2011; FILE; RAVACHE, 2021) conceptualize them as a set of areas with predominantly arboreal vegetation and/or in a natural state that cities have, whether these areas are public or private. These areas include trees in squares, public parks, streets, avenues, other green areas, vacant lots, vegetable gardens, and even cemeteries. In addition, it is emphasized that the urban vegetation occupies three spaces: the free areas of public and collective use, the private free areas, and the areas that accompany the road systems, whether roads or arteries.

In the view of Santos et al. (2019), green infrastructure can also be defined as a network of interconnected green spaces that conserve the natural values of an ecosystem and provide benefits to human populations. Concerning the occurrence of it, Rodrigues et al. (2020), reiterate that they have functions: ornamentation, increase leisure, and/or improve the quality of life of the population of these places. As for the improvement in quality of life, Dorneles et al. (2020) and Szeremeta and Zannin (2013), concluded that they act on longevity, cardiovascular diseases, obesity, mental health, sleep quality, disease recovery, and birth outcomes.

A more accurate observation was reported by Scheuer and Neves (2016), as they observed that green areas provide shade for vehicles and pedestrians, mitigate noise pollution, dampen sound, and preserve wildlife. These functions performed by green areas in urban perimeters justified and increased the relevance of this study, especially because it generated data that may be useful to municipal administrations regarding the Afforestation Plan, and improvements in the quality of life of the population.

2 GOAL

To quantitatively and qualitatively assess the benefits of green areas and their influence on the quality of life of the population of urban centers.

3 METHODOLOGY

The method used in this research was the **R**evision **S**istemática da **L**iteratura (RSL), adapted from a synthesis elaborated by Morandi and Camargo (2015). In it, the authors state that this is research with qualitative and quantitative scope, because there will be the need to survey a growing volume of published results, sometimes similar, others contradictory. In addition, the authors emphasize that the RSL is extremely relevant for good research on a given theme since it serves to map, find, evaluate, consolidate, and add results to the design of new studies.

To obtain the literature, five selective descriptors associated with the theme were used: (1) Green Areas; (2) Management; (3) Quality of Life; (4) Health, and (5) Urbanization. These descriptors were necessary for the elaboration of the work in question since they served as a foundation for the research. Thus, they should be inserted in three sections of the selected publications: title, abstract, and/or keywords, individually or in association with each other.

The collection of documentary information occurred from national journals, stored in databases with free access: Google Scholar, Google Scholar, Journals, and Annals of Congress on vegetation and urbanization. After this definition, the time frame for the last 12 years (2010 – 2021) was established, whose justification is based on the meager number of publications in the first decade (2001 to 2011) after the promulgation of the Statute of Cities in 2001. From the determination of the time frame, the objective was greater effectiveness in obtaining information regarding the research theme.

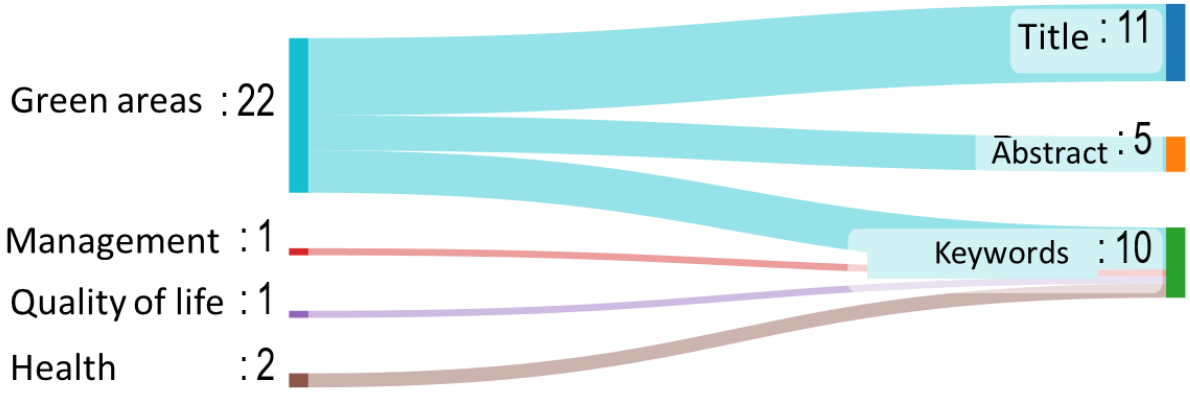
After the selection and reading of the literature, the statistical analysis of the data obtained with the use of electronic spreadsheets contained in the Microsoft Office Excel 2013 *software* was carried out, for the application of Descriptive Statistics: absolute frequency (*fi*), relative (*fr* %) and arithmetic mean ($\overline{x}$), to verify the use of the five descriptors in the three sections (Title, Abstract and Keywords) of the articles. The figures were elaborated with the application of the *software*

4 RESULTS AND DISCUSSION

4.1 LITERATURE SELECTION

Regarding the selection of the literature, the data obtained and analyzed indicated that of the 29 (n = 100%) pre-selected literature, most of them (*n* = 23.0; 79.3%) presented at least one of the isolated selective environmental descriptors in the three sections analyzed (Title, abstract and keywords). Regarding the section and quantification of the descriptors chosen for this research, the data obtained indicated that "Green Areas" was the most prolific in the title section, and "Health" in the keywords (Figure 1).

Figure 1 - Values regarding the individual occurrence of descriptors in three sections (title, abstract, keywords) of the selected scientific literature.



Source: authors (2023) Made with SankeyMATIC

In Figure 1, it can be observed that, of the six descriptors used, only five of them were identified in the 23 selected literatures, "green areas" being the most used term in the three sections analyzed. In the application of descriptive statistics, the data obtained indicated that "green areas" was the most prolific research in terms of association of the relationship of these areas with management and quality of life (Table 1)

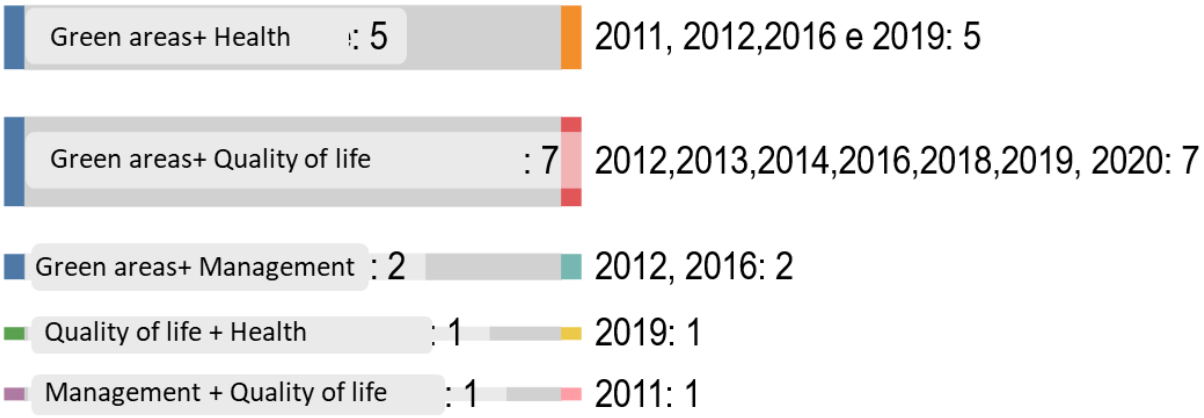
Table 1. Statistical data from the selected literatures.

Descriptive statistics	Green areas	Management	Quality of Life	Health
RF (%)	84,6	3,8	3,8	7,6
Maximum	22	1	1	2
Minimum	5	0	0	0
$\bar{x} \pm \sigma$	7.3±3.2	0.3±0.6	0.3±0.6	0.7±1.2

Elaborated from data obtained by the authors (2023).

In Table **1**, it is noted that the researchers used two descriptors: "management" and "quality of life" less frequently **(***n* = 1.0: **3.8**%), whose individual mean value was low (7.3±3.2), **and always as keywords**. For Pompei (2010), the use of these descriptors is important to search for articles more specific on the topic of the study. After applying the associated descriptors in the 23 selected literature, data analysis indicated that the vast majority of them **(n = 15.0;** 65.2%) presented associated descriptors, with a higher frequency for "Green areas and quality of life" (n = 7.0;46.6%) were the most used (Figure 2).

Figure 2. Use of descriptors in pairs, and identified in the 23 selected literature.

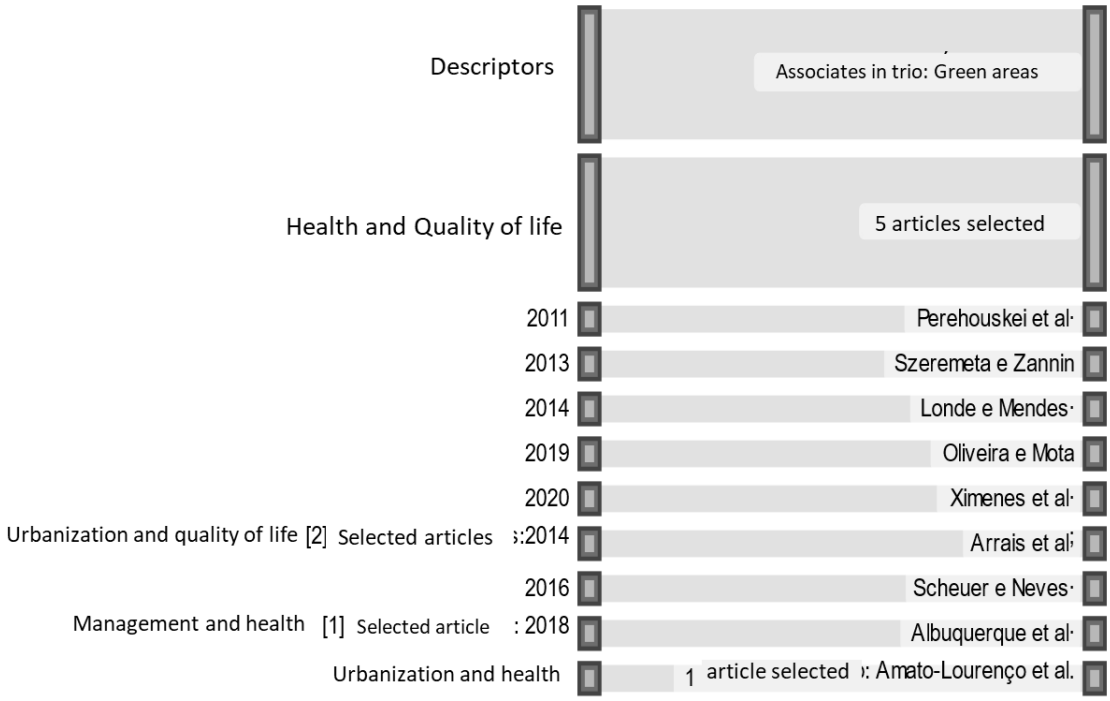


Elaborated from data obtained by the authors (2023). Made with SankeyMATIC

It was verified from the data in Figure 2 that the first association (green areas and quality of life was the most frequent (n = 46.6%) and was used by the following authors, depending on the year of publications: Pina; Santos (2012); Szeremeta; Zannin (2013); Londe; Mendes (2014); Scheuer; Neves (2016); Maia et al. (2018); Santos et al. (2019); Dorneles et al. (2020). This indicates that for these authors, green areas provide better quality of life from the mitigation of solar incidence, by the presence of the canopy and/or canopy, if so formed, shading, and greater ventilation since these structures of the arboreal vegetation serve as barriers to the wind, lower concentration of carbon dioxide (CO^2) in the atmosphere because it may occur capture, use and storage of this substance, as well as release more oxygen gas (O^2) into the atmosphere as a product of photosynthesis performed.

It was found that "Green Areas and Health" was the second most verified association in the analyzed literature, which demonstrates that researchers have some concern about the absence of vegetation and the problems in the health of individuals, especially children and the elderly since it can directly affect the quality of life. In addition, there were scientific articles (n = 9; 39.13%) that dealt with the descriptors "in the trio" (Figure 3).

Figure 3. Distribution, identification of authors, and year of the 23 selected publications that used, in a trio, the selective descriptors.



Prepared by the authors (2023). Made with SankeyMATIC

In Figure 3, it was evident that the association between the most used descriptors involved "green areas health and quality of life", when compared with "green areas, urbanization and quality of life" and "green areas management and health and urbanization and health". This makes it clear that the conservation and maintenance of these areas are factors that directly contribute to the maintenance of the health of the community, improve landscaping, and contribute to a reduction in the cost of respiratory diseases, among others.

For Amato-Lourenço et al. (2016) green areas are suppressed in urban areas and this has compromised the health of the community. Regarding the association in the trio, it was found that the descriptors "Green areas, health and quality of life" (Perehouskei et al., 2011); Szeremeta; Zannin (2013); Londe; Mendes (2014); Oliveira; Mota (2019) and Ximenes et al., 2020), were the most prolific (5; 55.55%). In addition, other relationships were observed between "Green areas, urbanization and quality of life", carried out by the authors Arrais et al. (2014) and Scheuer (2016), which is equivalent to a percentage of *n*= 22.22%. Only one literature was found that contained the association of 4 descriptors (Green areas; urbanization; health; quality of life).

5 URBAN GREEN AREAS

Regarding the definition of green areas, Perehouskei et al. (2011) define them as free areas, public or private, that present predominantly tree and/or shrubby vegetation cover that perform

potential functions capable of providing human well-being, and to the environment which according to Arrais et al. (2014) can happen through the mitigation of pollution, support to urban fauna in particular, insects, birds and soil fauna, geomorphological stability, in addition to performing aesthetic functions. All these functions, be they aesthetic, ecological, or social, can relate and result in financial benefits.

Also following this logic, CONAMA Resolution No. 369/2006 conceptualizes urban green areas as being the public domain space that contributes to ecological, recreational, and landscape functions, with the ability to contribute to the improvement of the functional, aesthetic, and environmental quality of urban centers, composed of arboreal, shrubby or creeping vegetation and spaces free of waterproofing.

Pina and Santos (2012) emphasize that these areas can also be classified as places that present vegetation inserted among the urban structures, such as gardens, parks, small gardens, forests, existing cemeteries, alleys, sports squares, *play-lots* (lots of games), playground (children's playground), campsite, bathhouses, permanent preservation areas (APP) and urban conservation units, although the authors did not report the size that the vegetation should present predominantly in these places (arboreal, shrubby, herbaceous).

In this context, in the perception of Amato-Lourenço et al. (2016) and Steuer et al. (2012), the correct planning of these areas, directly or indirectly, will meet the needs of the urban population for open spaces that enable leisure, recreation, as well as nature conservation. However, Perehouskei et al. (2011), emphasize that these areas are not exclusively focused on leisure and recreation, because it is also necessary to insert adequate equipment and infrastructures that can offer leisure and recreation options at small distances from the houses and to different age groups.

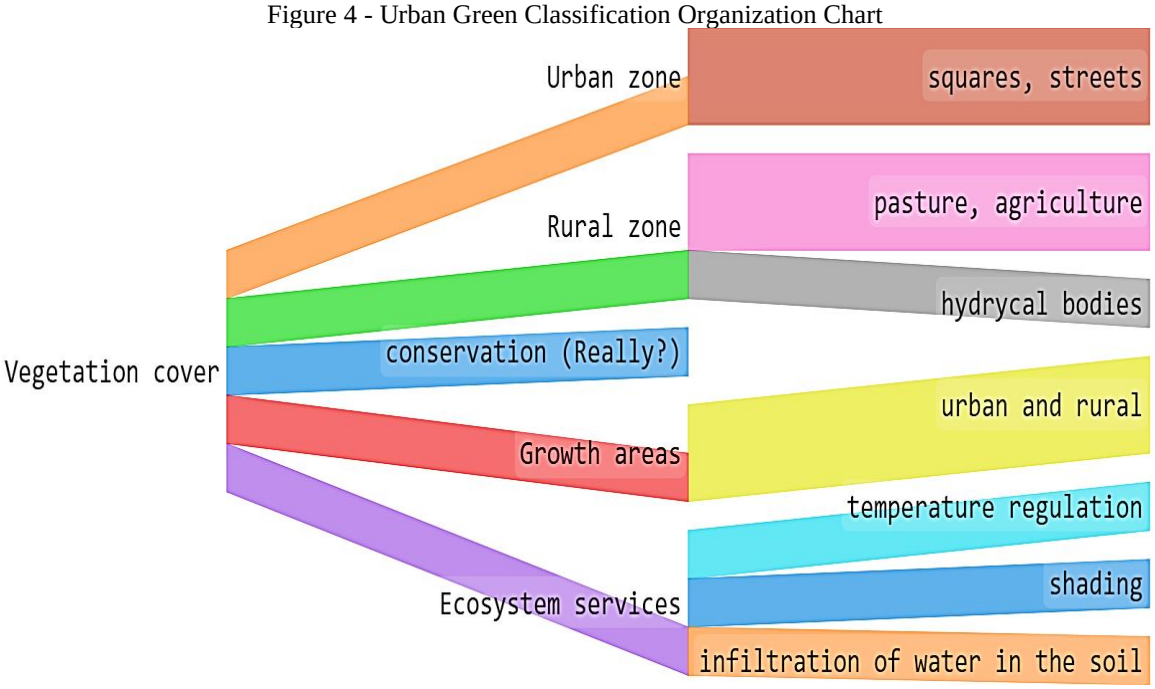
6 CLASSIFICATION OF GREEN AREAS

The existence of several criteria for the characterization of urban green makes the choice of methodologies for the selection and mapping of these areas difficult. In some cases, the mapping of these areas does not follow criteria of categorization and/or classification, while in other cases there is a greater concern with the classification so that it is more appropriate to the area being studied (BARGOS; MATIAS, 2011)

In this scenario, Rodrigues et al. (2020), Dorneles et al. (2020), and Arrais (2014), based on research carried out, suggest that free spaces can be classified as follows: (1) regarding their typology: in this regard, it is defined whether these spaces are public, potentially collective and/or private; (2) as to its category: in this regard, it is defined whether in this space there is the presence of gardens, green roads, and squares. The classification of these free spaces can help differentiate green areas from other

types of free spaces. Based on these classifications, Buccheri and Nucci (2006) elaborated an organizational chart for the classification of urban green (Figure 4).

Figure 4 - Urban Green Classification Organization Chart



Source: Adapted from Buccheri and Nucci (2006). Made with SankeyMATIC

7 BENEFITS OF AFFORESTATION

Regarding the benefits provided by afforestation, the data obtained and analyzed indicated that they are essential for the improvement of the quality of life, especially in urban centers, where there is a high disturbance of the environmental balance. Regarding the improvements made by green zones, Barreto et al. (2019), in research on the benefits of living near green areas, state that they are classified according to the activities to be performed, in addition, these can present advantages (1) ecological, (2) aesthetic, (3) economic and (4) social.

In a study by Londe and Mendes (2014), they concluded that both ecological activities have the function of mitigating the negative impacts of urbanization, in which the microclimatic improvement of urban centers stands out, given that trees absorb solar radiation, provides shade, absorb carbon dioxide (CO_2), which increases atmospheric humidity and oxygen content, in addition, vegetative species soften air temperature and favor the direction and direction of winds.

Still about the benefits of afforestation, Oliveira Filho et al. (2013), also help in improving the infiltration of water in the soil, with inhibition of erosion processes, to provide soil stability. In the conception of Perehouskei et al. (2011), in a study on the importance of green areas and public services, emphasize that vegetation, in addition to increasing environmental comfort, mitigates air pollution,

and acoustic pollution, protects springs, springs, as well as serves as a shelter for wildlife and genetic conservation of native flora.

As for the aesthetic benefits, they range from the beautification of cities to the promotion of psychological well-being, since with the change of seasons, there is a change of colors, textures, and shapes of flowers, leaves, fruits, and trunks and this provides added dynamism to the urban landscape and consequently breaks the monotony of masonry and pavements. As for the benefits to mental health, they are inserted in the aesthetic benefits, in which the minimization of negative impacts stands out, such as stress, high agitation, sadness, anxiety, fear, and depression (OLIVEIRA; MOTA, 2019).

Concerning improvements in the social sphere, the insertion of afforestation in urban environments still stimulates the economic activity of cities, because they raise the tourist attractions, which make them known for the diversity of trees planted in these locations. In addition, the presence of afforestation also contributes to the valuation of properties located near these areas, however, during the summer the trees provide shade and in the winter there is an absence of shade, when it comes to deciduous species thus resulting in the reduction of energy consumption in air conditioners (ARRAIS et al., 2014).

Pina and Santos (2012), in research on the influence of green areas on the quality of life obtained data that allow us to affirm that for the social context, the insertion of green spaces is related to the creation of areas that enable moments of recreation, leisure, and social interaction of people with different economic conditions and age groups, resulting in the exchange and creation of bonds respecting their urban experience and contact with other people, In addition, these areas can serve as a stage for political and cultural manifestations. Therefore, the existence of these green areas as recreational spaces stimulate the inhabitants to practice physical activities, thus reducing the tendency to a sedentary lifestyle.

8 MAIN PROBLEMS ASSOCIATED WITH URBAN AFFORESTATION

The planting of trees incompatible with urban structures results in numerous problems, such as damage to sidewalks, homes, walls, power and communications networks, hydraulic networks, clogging of gutters and culverts, damage to underground water and sewage pipes, accidents caused by falling branches and/or trees, especially on days of gales, in addition to interference in the free movement of people and vehicles (BARGOS; Matthias, 2011).

According to Pinheiro et al. (2018), these conflicts are the result of inadequate management and are often harmful to tree individuals, since the physical space where they were inserted does not match the development of their size, extent of the crowns, roots, as well as their diameter. Generally, some large species have superficial roots of large extensions and the incorrect sizing of the physical

space they will occupy will result in damage to streets and sidewalks. If this occurs, the bed should be enlarged and avoid cutting superficial roots, as they perform the function of support.

Therefore, those responsible for urban afforestation must evaluate the probable conflicts with walls, curbs, sidewalks, buildings, electricity networks, water networks, communications, sewage, and also impediments regarding the displacement of people and cars, to act in accordance with the pertinent laws, through the correct choices of species, constant maintenance of the same among other concerns that involve the planning of urban afforestation (SCHEUER, 2016; PEREHOUSKEI; DE ANGELIS, 2012; PEREHOUSKEI et al., 2011).

9 CONCLUSION

The benefits provided by the green area to the quality of life of the population where such areas are conserved, comes from the ecosystem services that the proportional plant biomass as the regulation of temperature, which has been proven by studies already carried out. In addition, the removal of carbon dioxide and the insertion of oxygen gas into the atmosphere is another benefit provided by green areas in the urban environment, even if it has an extensive vehicle fleet and the constant use of petroleum-derived fuels.

The maintenance in public squares, recreational clubs, sports practice areas in the urban perimeter is essential to the quality of life of the regulars and users. In addition, the diversity that this proportional improves the quantity of the environment, keeping it in harmony with the health not only of the human body, but also of the mind, since the presence of places with vegetation in urban areas, provides a scenic landscape more participative in the body-mind balance.

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