Environment and Wellbeing: Assessment of quality of life through vegetation index in a neighborhood of a small-medium-sized Brazilian city

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Abstract

The presence of vegetation in urban spaces is a crucial indicator for describing the quality of life of city inhabitants. The lack of green areas can contribute, primarily, to an increase in the sensation of thermal discomfort during periods of intense heat, negatively impacting the health and comfort of residents. Thus, the aim of this article is to investigate the intrinsic relationship between the vegetative environment and human well-being, with a specific focus on the community of Alvorada Neighborhood in the municipality of Guanambi, Bahia, Brazil. Therefore, the study addressed the delimited area in a way that provided the necessary foundation to highlight that the Vegetation Coverage Index (VCI) has a significant impact on the overall state of the population. Aligned with Sustainable Development Goals (SDGs) 3 (good health and well-being), 11 (sustainable cities and communities), and 13 (climate action).

Introduction

Traditional medicine operated based on the treatment of health complications; however, current medical practices have advanced towards a perspective of proactively promoting quality of life. This involves establishing a balance between the well-being of the population and the connection with leisure, green environments, and pleasant climates. Numerous authors, such as Josipovic, Ludwig, and Wahid et al., emphasize a quantitative link between diseases and/or discomfort derived from excessive heat resulting from the absence of green areas.

According to Josipovic and Ludwig (2012), heat stress refers to the impact of ambient temperature on an individual's physiological and psychological system, representing the body's response to prolonged exposure to elevated thermal conditions, resulting in water and salt loss. When temperatures reach extremes affecting the human body's ability to maintain homeothermy, symptoms ranging from mild to moderate, such as dehydration, dizziness, nausea, and weakness, can be triggered.

Furthermore, as per a study conducted by Wahid et al. (2023), elevated temperatures can lead to imbalances in hormones and neurotransmitters, contributing to complications related to psychological disorders like depression and anxiety. The discomfort caused by excessive heat is associated with changes in sleep quality, mood, increased irritability, and stress, negatively impacting mental health.

Given the presentations regarding the effects of climate on health, the influence of green areas in urban centers and their relationship with health is subsequently presented. It is an integrated approach that values nature as an ally in health prevention, crucial for sustainable development and the creation of healthy and resilient urban environments (UN, 2015).

Green areas in urban environments are dedicated spaces for vegetation, landscaping, and nature preservation (Bargos; Matias, 2011). These areas encompass parks, squares, public gardens, and other spaces containing vegetation, such as trees, shrubs, and flowers (Rubira, 2016). They hold social, ecological, scientific, and cultural importance, offering places for gatherings, recreation, biodiversity preservation, environmental sustainability. They must aim to satisfy three primary objectives: ecological-environmental, aesthetic, and recreational (Amorim; Lima, 2006), contributing to the cohesion with people's quality of life.

The assessment of vegetation coverage is a crucial factor in analyzing the population's quality of life, as the presence of green spaces brings benefits to balancing urban environments (Oliveira, 2016). Therefore, preserving and expanding these areas are essential aspects to be developed in urban projects that seek to promote sustainable development and a better quality of life for citizens (Ramos; Nunes; Santos, 2020).

However, long-term changes in temperature and climate patterns due to climate change, characterized by phenomena such as the increase in global average temperature and alterations in rainfall patterns (UN, 2023), have led to transformations. The relationship between urbanization and climatic aspects is intertwined with the formation of heat islands, where intense urban development contributes to local temperature increases (DIAS, Felipe Teixeira et al., 2023). The presence of paved surfaces, such as asphalt, hinders water absorption by the soil, contributing to heat accumulation and the reduction of green areas for building construction (Callejas; Durante; Rosseti, 2015).

This issue has raised significant concerns for global entities, such as the United Nations (UN), which includes climate change, health, and well-being in the objectives for improvement in the 2030 Agenda (UN, 2015). However, while many global studies emphasize the importance of vegetation for well-being, the lack of local research leaves a gap in understanding how this relationship manifests in Guanambi-BA, highlighting the need for in-depth environmental investigation.

It is worth noting that in areas with higher vegetation indices, a better quality of life is expected, with lower stress levels, better mental health, and higher overall satisfaction compared to areas with scarce vegetation (Barreto, P. A. et al, 2019). A lesser-known fact is the psychological impact of high temperatures and its correlation with increased aggression, as demonstrated by research from Iowa State University (Anderson; DeLisi, 2011).

Thus, when placed in the context of the studied territory, concerns arise regarding its population. In this perspective, delving into the territories of Guanambi necessitates focusing on a specific area, namely, the Alvorada Neighborhood, characterized by a prevalence of constructions and limited green areas, raising important questions about the scarcity of vegetation that can influence the well-being of residents.

Given the above, this study aimed to quantitatively evaluate the green areas of the Alvorada neighborhood in the municipality of Guanambi-BA, based on the interpretation of aerial photographs from 2022 and the use of the Vegetation Coverage Index to analyze and quantify the neighborhood's vegetation coverage. Additionally, it sought to contribute to preventive medicine by providing insights for the development of quality of life and collaboration for the construction of sustainable urban communities.

Delimitation of the area under study

The theoretical-methodological framework that underpinned the construction of this study is reflected in the research question: Is the Vegetation Coverage Index (VCI) in the Alvorada neighborhood satisfactory for the well-being of the population? Thus, regarding the materials and methods used in this study, it was first necessary to divide the sections as follows: a) definition of the study area – Alvorada neighborhood; b) selection of methods related to this study - Ecological study, assessing the environmental context and its relationship with the assigned population; c) delimitation of vegetation coverage indicators – According to the indices recommended by the World Health Organization (WHO) – the Vegetation Coverage Index (VCI) is below the expected for the region; d) selection of terms – VCI, PVC, and analysis of satellite images of the disposition of vegetation coverage in the study area.

The study area of this work corresponds to one of the 57 neighborhoods (IBGE, 2010) in the city of Guanambi, Bahia, namely the Alvorada neighborhood, which, according to the demographic census from DataSUS in 2023, has an estimated population of 3,948 inhabitants. The area was delimited considering the vegetation patterns found in this region, given the intense expansion of its territory with the emergence of many local businesses. Thus, in addition to planning recreation, there is a significant need to prioritize green areas that offer tranquility, air quality, and sustainability for the population and visitors.

The vegetation coverage index reflects the relationship between the vegetation coverage of urban spaces and the population density of a territory. Thus, the studied territory has 3,948 inhabitants (DataSUS) in an area of 328,310 m². The total canopy area found for the analyzed perimeter was 19,073 m².

Conclusions

The study contributes to the related thinking between medical practice and quality of life through the influence of green areas, as these spaces promote an environment conducive to physical and mental well-being, thus reducing the prevalence of diseases. Since poor environmental conditions play factors for the low levels of the overall health of the population. In this way, the article provided theoretical knowledge on the subject as a society, in addition to forming knowledge for the future work area, since medical care involves more than clinical studies, such as understanding the environmental and social conditions that impact health.

The present study concludes that the Alvorada neighborhood presented low vegetation indices, which are at a critical level compared to the recommendations of the Brazilian Society of Urban Afforestation (SBAU) and the World Health Organization - WHO. Thus, as this work is based on the premise that the presence of vegetation cover in urban space contributes significantly to the increase in urban environmental quality, the presence of adequate vegetation in the locality promotes shading, improvement of air quality, reduction of noise pollution, and assistance in thermal regulation, thus bringing balance between the modified space for urban settlement and the environment (Dias, Felipe et al., 2020).

According to the Climate Observatory (2009), thermal comfort conditions will affect thousands of people, so that the increase in temperature will affect human health in different proportions, being even more accentuated in urban areas due to the abundance of surfaces that retain heat. Still in 1994, Dr. Saldiva described the main physiological changes in the face of the impacts of climate change, such as an increase in cancer, heart, infectious, and respiratory diseases, heart attacks, and extreme dehydration. It is worth noting that this impact is particularly evident among the elderly and people with pre-existing conditions, that is, they are more susceptible to the adverse effects of climatic conditions. Due to the abrupt increase in temperatures, these diseases may occur in the coming years, such as those related to allergens.

Therefore, it is emphasized that public policies and interventions play an essential role in mitigating the impacts of climate on quality of life. It is necessary to implement public policies aimed at sustainable urban planning in the region, with the aim of promoting the preservation and expansion of green areas. This action becomes essential to ensure a balanced and pleasant urban environment, and it not only covers the specific area but the city as a whole, thus reaffirming the commitment to the quality of life and well-being of the Guanambi community. In this context, this article fits as an element that seeks to fill gaps and open doors for further investigations, in addition to positively influencing the understanding of the complex interactions between nature, society, and health.

Given the above, it was possible to highlight the positive factors that emerged from this study due to the in-depth understanding of the complex interactions between environmental conditions and the health status of the population. Additionally, the integrated approach allowed reflecting on how climate change tends to exacerbate health problems. However, it is crucial to recognize the inherent limitations of the study, with the restricted availability of specific data publicly available with limited access, which may have impacted the breadth of the analysis.

Furthermore, time constraints may have reduced the extent of the research, preventing a deeper exploration of certain aspects. Given the identified limitations, it is suggested that future studies seek to expand the database, incorporating different geographical and demographic contexts, as well as investing in long-term research that can allow a robust understanding of trends over the years. Thus, by addressing the identified limitations and exploring new research paths, one can continuously improve understanding and, consequently, develop more effective strategies to promote health in communities affected by environmental conditions.

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References

Amorim, M. C. de C. T., & Lima, V. (2006). A importância das áreas verdes para a qualidade ambiental das cidades. Revista Formação Online, 1(13). https://tinyurl.com/qwbegdu.

Anderson, C. A., & Delisi, M. (2011). Implications of global climate change for violence in developed and developing countries. Iowa State University, USA, 249-265.

Bargos, D. C., & Matias, L. F. (2011). Áreas verdes urbanas: Um estudo de revisão e propostas conceituais. Revista da Sociedade Brasileira de Arborização Urbana (REVSBAU), 6(3), 172-188.

Barreto, P. A., et al. (2019). Is living near green areas beneficial to mental health? Results of the PróSaúde Study. Revista de Saúde Pública, 53, 75.

Callejas, I. J., Durante, L. C., & Rosseti, K. A. C. (2015). Pavimentação Asfáltica: Contribuição no Aquecimento de Áreas Urbanas. E&S - Engineering and Science, 1, 64-65.

Dias, F., et al. (2020). Cobertura vegetal e qualidade de vida: estudo sobre as praças da cidade de Guanambi, semiárido

baiano. Paper presented at the 72º Reunião Anual da SBPC, 1-4.

Dias, F., et al. (2023). Environmental challenges to Gray cities becoming green cities. In E. Ariza-Montes & N. Lardy (Eds.), SDGs in the Americas and Caribbean Region (pp. 521-544). Springer International Publishing.

United Nations (2015). Objetivos de Desenvolvimento Sustentável. As Nações Unidas no Brasil.

Josipovic, S., & Ludwig, E. (2012). Heat Stress: Causes, Treatment and Prevention. Nova Science Publishers, Inc.

Ramos, H. F., Nunes, F. G., & Santos, A. M. DOS. (2020). Índice de áreas verdes como estratégia ao desenvolvimento urbano sustentável das Regiões Norte, Noroeste e Meia Ponte de Goiânia-GO, Brasil. Cuadernos de Geografía: Revista Colombiana de Geografía, 29(1), 86–101.

Oliveira, B. B. (2016). Projeto De Parque Urbano Ecológico Nas Margens Do Rio Poxim, Sergipe. Laranjeiras: Universidade Federal de Sergipe.

Wahid, S. S., et al. (2023). Climate-related shocks and other stressors associated with depression and anxiety in Bangladesh: a nationally representative panel study. Articles, 7.