

# **An Analysis of the Park “Jardim da Luz” in the Municipality of São Paulo, SP, as an Urban Resilience Spotline**

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## **Abstract**

The accelerated real estate speculation has promoted a decrease in green areas, intensifying the socio-spatial exclusion and an overload on the natural environment. This work had as methodology, the use of geotechnology in the analysis of the landscape in the scope of land use and occupation, Land Surface Temperature and Vegetation Index considering a distance of 5 km. Thematic maps were generated that highlighted the surrounding landscape, thus evidencing the green infrastructure, land use and variation of the thermal field. The work aims to show the importance of Park “Jardim da Luz” in the environmental quality of the city and population of São Paulo, SP, Brazil. Thus, this research can contribute to the study of environmental sustainability in the context of metropolises, promoting actions that encourage good practices in the conservation of these public spaces that increasingly represent an oasis of quality of life in urban areas.

**Keywords:** Green infrastructure, Landscape, Health.

## **Introduction**

The Metropolitan Region of São Paulo (RMSP), including the municipality of São Paulo, concentrates a high index of vehicles, industries, buildings, high demographic density and impermeable surfaces. The intense urbanization allied with the almost total absence of vegetation contributes to the heat island process (Lombardo, 1985).

The interconnected green spaces, which comprise the urban open spaces, in the context of urban planning, promote ecosystem services, such as watershed function, environmental control, climate regulation, leisure and recreation, thus providing vast benefits to society (Cormier and Pellegrino, 2008). Thus, green areas promote social development, well - being, benefits to physical and mental health of the inhabitants.

The work intends to evaluate, through geotechnologies, application of questionnaires and an exploratory analysis of the data. Showing the importance of Park “Jardim da Luz” in the environmental quality of the city and population of São Paulo, SP, Brazil.

## **Background and Literature Review**

Urban areas need to improve environmental conditions, such as the creation of public green areas, such as parks. Thus, it is desirable the arboreal vegetation, which value the quality of life of the inhabitants, such as thermal comfort, attenuation of air thermal comfort, attenuation of air, noise and visual pollution, and shelter for fauna, besides providing leisure and provide leisure and recreation for the population, encouraging social interaction and community life (Nucci, 2008).

In parks, health policies can be developed that will be positive in the public health sector, such

as encouraging and promoting physical activities, benefiting people, society and physical environment (Matsudo et. al., 2006).

Within the health benefits that parks can offer are the free areas free areas with green area for physical activities of the inhabitants. The World Health Organization (WHO) recommends that, depending on the type and intensity of physical activity at least 30 minutes of regular daily activity can reduce the risk of cardiovascular disease and diabetes, improves the functional state of the elderly, and has benefits in relation to other ills associated with obesity (Who, 2006).

The park “Jardim da Luz” in the Municipality of São Paulo, SP, has the oldest green area in the city that was initially a Botanical Garden, with an initiative of the Portuguese Crown in 1798, and opened to the public in 1825 (MONUMENTS SP, undated).

The park, located in the district of Bom Retiro, which contains the Pinacoteca do Estado became popular during the government of João Teodoro (1972, 1875), The park, located in the district of Bom Retiro, contains the museum of the Pinacoteca do Estado family outings and a meeting point for passengers getting off at Luz Station (SÃO PAULO in foco).

It is noteworthy that the park, has the surroundings that participates in the history of the life of São Paulo citizens. In this space there is the use of squares, meeting, dialogue fun, traffic. And it remains, with the character of a museum, with statues, fountains.

Thus, this green area is a place of contemplation within the intense urbanization of the metropolis areas, homogeneous space, little functional, contains the marks of history (Meireles, 2013).

## **Method and Data**

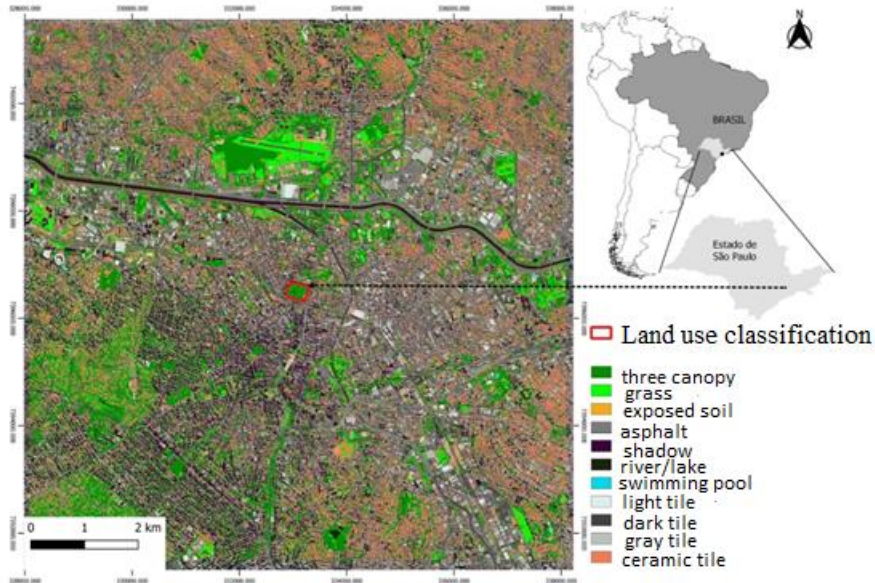
The study area of this project will be the municipality of São Paulo, SP (Figure 1), where the urban parks will be analysed: Jardim da Luz (central zone), localized on Subprefecture of Sé.

In this work, the urban park of the city of São Paulo was mapped on a Geographic Information System (GIS) basis, using Quantum Gis (QGIS) software, obtaining Terrestrial Surface Temperature (TST) and Vegetation Index Vegetation Index (NDVI), using CBERS4A images and for TST, Landsat 8.

The maps highlighted the socio-environmental importance of the park “Jardim da Luz”, in the Central zone in the municipality of São Paulo. This space represents a spotline of environmental resilience in the city, with a high index of green infrastructure.

Also was applied the questionnaires, to evaluate the survey of the socio-environmental reality and can infer the importance of public open spaces for health. According to Lombardo (1995), the questionnaires must meet the proposed reliability and speed, and may have a more generalized or specific strategy.





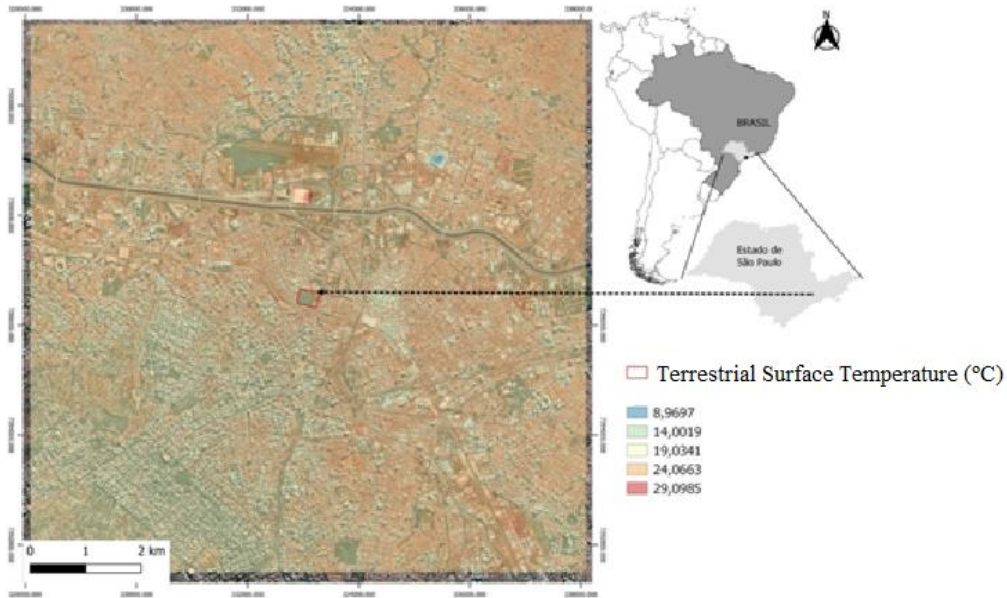
**Figure 2: Land use classification of Parque Jardim da Luz. Source: CBERS4A Image, 2020.**

As for the Terrestrial Surface Temperature (TST) (Figure 3), the tree vegetation has 14 °C temperature and the shrub vegetation has 19 °C. The built-up area has a temperature ranging from 24 to 29 °C.

The TST map presents the Heat Island configuration in the central region of the city of São Paulo, with a variation of 20.13 °C. It is noteworthy that the highest temperatures correspond to the built and asphalt areas and the lowest temperatures are related to the areas with tree vegetation.

In this context the “Parque Jardim da Luz”, presents one of the lowest TST around 14%, demonstrating the contribution of green areas, especially the tree canopy as a significant function of ecosystem services assisting in the quality of life of the population.

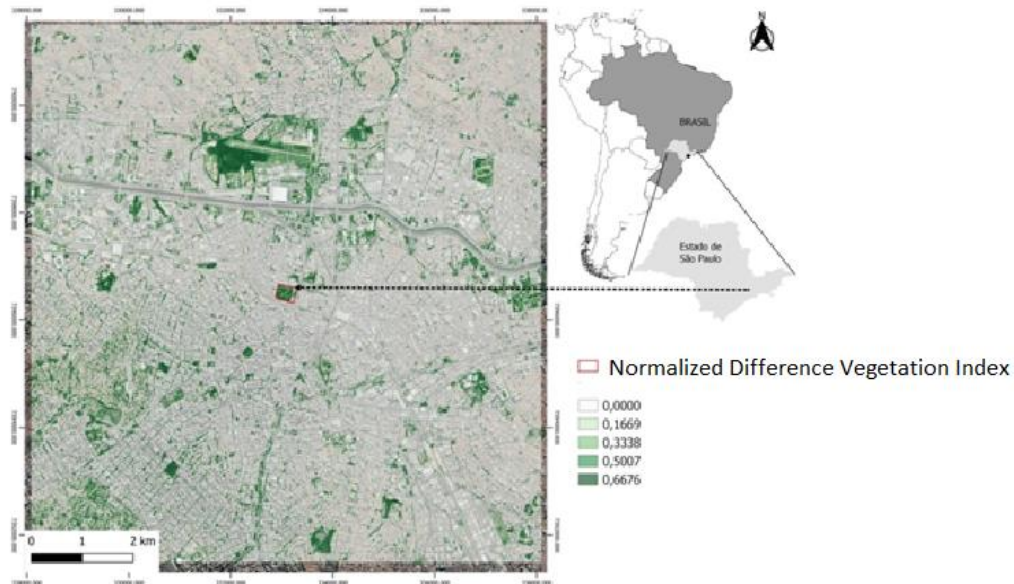
Vegetation among the important ecosystem services it provides, is the regulation of urban climate, as it helps to block the amount of radiation that would directly reach the ground surface and still photosynthesis produced by vegetation in the streets, squares or parks reduce surface warming and consequently the heating of the air, which produces the opposite of the heat island, but rather formation of cold islands in the midst of warmer areas in their surroundings and even amid heat islands, particularly in central regions of cities, so characteristic of urban climate (Garcia; Pardo 2016).



**Figure 3: Terrestrial Surface Temperature of Parque Jardim da Luz. Source: Landsat 8 image, 2020.**

Within the NDVI (Figure 4) the Jardim da Luz Park has an index ranging from 0.6676% (area with tree vegetation) to 0% (built-up area).

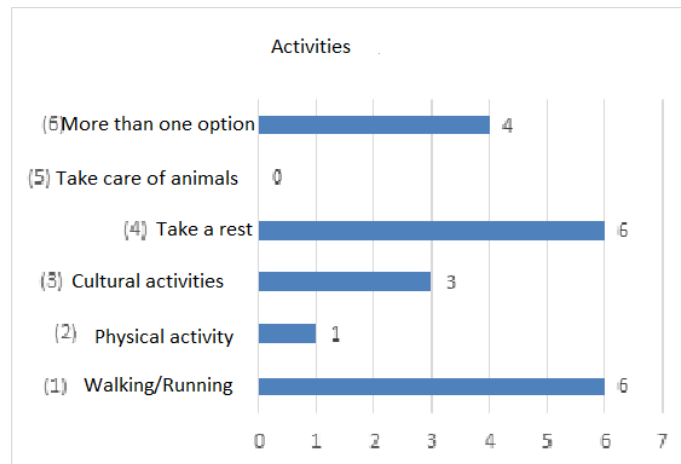
This map shows that in this 5 km perimeter of the park, there is a scarcity of tree and grass cover, predominantly asphalt, exposed soil and built-up area. In this context that the park represents an area of urban oasis and stands out as the highlight of the territory with urban resilience.



**Figure 4: NDVI of Parque Jardim da Luz. Source: CBERS4A Image, 2020.**

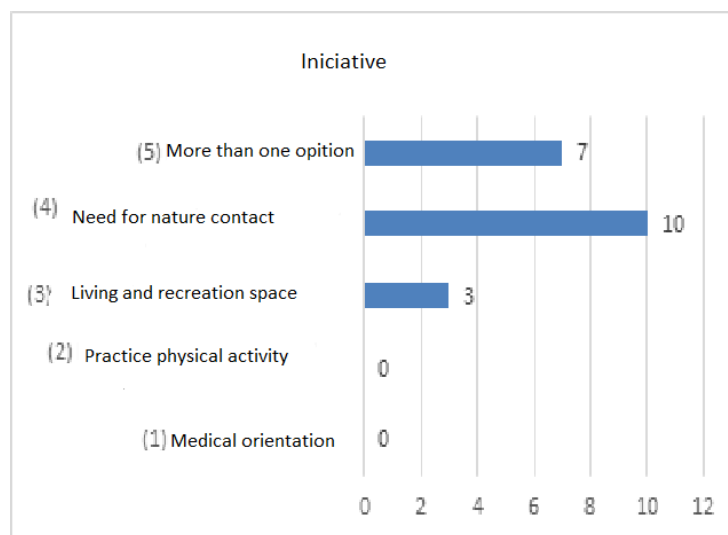
An exploratory statistical analysis of the park obtained in the questionnaires was performed, these were: activities (Figure 5), initiative (Figure 6), health benefits (Figura 7), thermal sensation (Figure 8), responsibility (Figure 9), lack of infrastructure (Figura 10).

About the activities performed by those who frequent the “Parque Jardim da Luz”, resting and walking/running predominate. As this is a park in the central area of the city, the regulars use this space to rest from the intense urban activity and thus this park is an oasis of contact with nature and contemplation of art allied with nature.



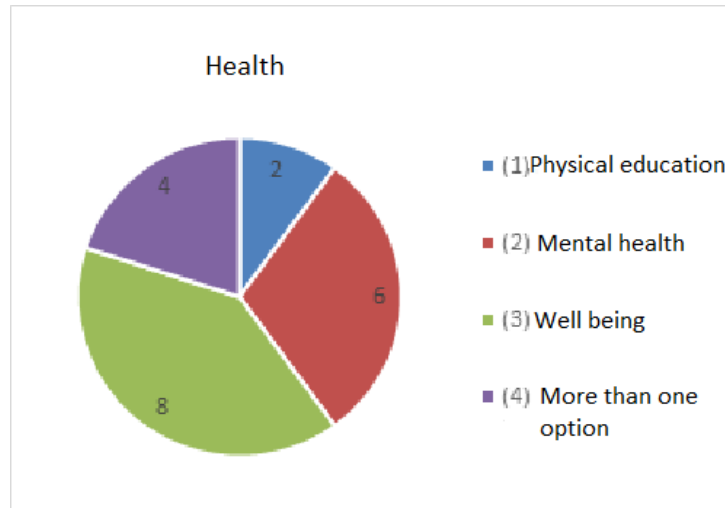
**Figure 5: Data about the activities performed by the interviewees. Source: Magda Adelaide Lombardo, 2021.**

In the case of the population's initiative to frequent the park, the need to be in contact with nature and also as a place for living and leisure stands out.



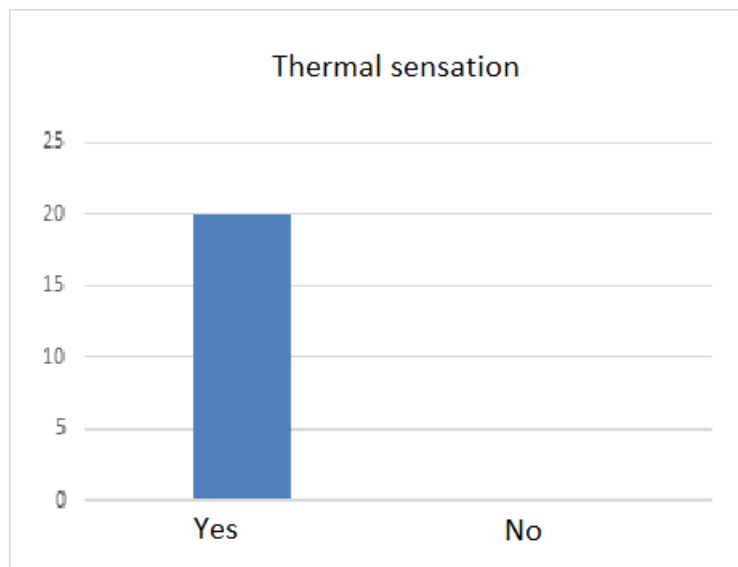
**Figure 6: Data about the initiative to frequent the park. Source: Magda Adelaide Lombardo, 2021.**

Regarding the health benefits, the use of the park predominates for the promotion of wellness for the population, followed by improvements in mental health. This highlights that the park is a source of well-being and that it contributes to the mental health of the inhabitants, which was evidenced at the time of the COVID-19 pandemic.



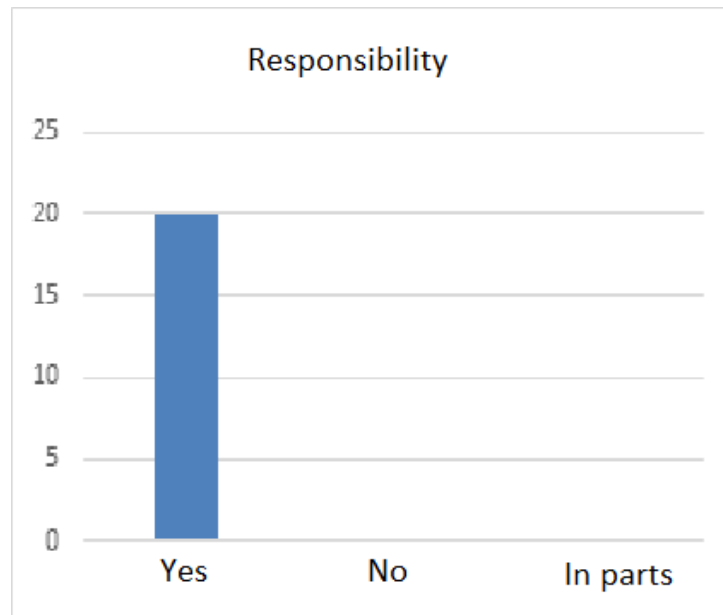
**Figure 7: Data about the health benefits to frequenting the park. Source: Magda Adelaide Lombardo, 2021.**

It is evident that all park goers highlighted the importance of this green area as a cooling space to mitigate the Urban Heat Island.



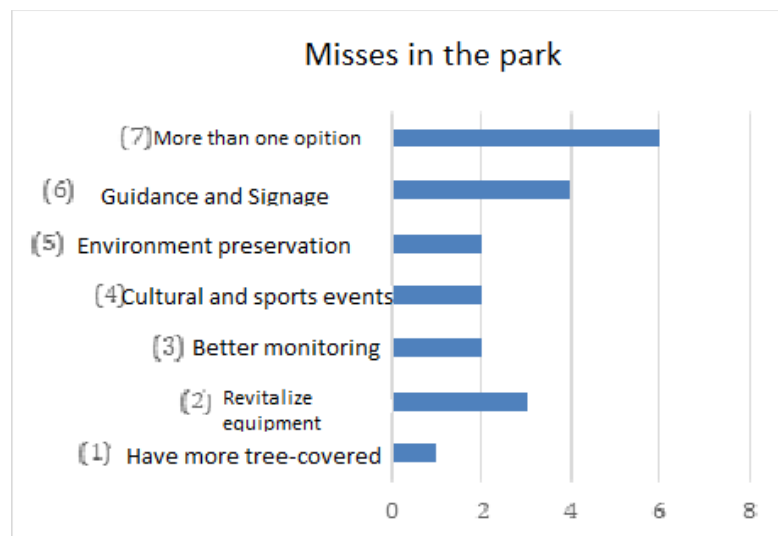
**Figure 8: Data about the thermal sensation. Source: Magda Adelaide Lombardo, 2021.**

All park goers feel responsible for the environmental quality of the park.



**Figure 9: Data about the environmental responsibility. Source: Magda Adelaide Lombardo, 2021.**

The population highlights the problem of security and lack of revitalization of the equipment. Because of the park's location, in the central area, the safety factor seems to be paramount, since all the problems that permeate the city center reflect in the park area.



**Figure 10: Data about what the interviewees miss in relation to the Parkó Source: Magda Adelaide Lombardo, 2021.**



## Discussion and Conclusion

The maps highlighted the socio-environmental importance of the park “Jardim da Luz”, in the Central zone in the municipality of São Paulo. This space represents a spotline of environmental resilience in the city, with a high index of green infrastructure.

The GIS methodology employed, with the QGIS software, highlighting the maps of land use classification map, Terrestrial Surface Temperature, and Vegetation Index, showed an importance of the landscape study with emphasis on land use, heat island and vegetation index. As for the application of questionnaires, it proved to be efficient for the significance of park attendance on physical and mental health.

The environmental quality of this park is directly linked to the rate of vegetation cover and good infrastructure of its equipment, presenting a pleasant landscape to the citizen, since other scenarios of urbanization show a considerable volume of built area with reduced mobility, vacant land and lack of green areas. Although the lack of security in the area reflects the experience of the population in the central area of the city of São Paulo

It was found that most people go to the park for their wellbeing and mental health, having an integration with the landscape, thus providing quality of life to the users. Therefore, this work could contribute to the study of environmental sustainability and urban resilience in the context of metropolises.

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