

Land use and coverage in Urbano Santos, Maranhão, Brazil

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Abstract

- The aim of this research is to assess the alterations in land use and occupation within the municipality of Urbano Santos – MA over a 26-year span
- The study highlights the environmental impacts of these changes, including deforestation, biodiversity loss, and soil degradation. It emphasizes the need for sustainable agricultural practices to mitigate these effects and ensure the preservation of natural resources in Urbano Santos.

Research Question

Asking Questions

- Human interaction with the environment, especially regarding the use of natural resources, results in a series of environmental impacts. Given this scenario, we propose the hypothesis that the application of geoprocessing techniques will allow for a detailed analysis of landscape transformations, enabling the identification of patterns and relationships between economic growth and changes in land use and cover.

Introduction

Content Knowledge

- The state of Maranhão, especially municipalities within the cerrado biome such as Chapadinha, faces social vulnerability and a lack of data on land use dynamics. The region is under environmental stress from climate change and agricultural growth, worsened by insufficient public policy and government action, leading to concerns about haphazard land use.
- The project emphasizes the need for sustainable farming to alleviate negative impacts and protect Urbano Santos natural resources. Combining research with education, it seeks to enhance local understanding of land use changes and encourage environmental care, utilizing the GLOBE Observer Land Cover protocol.

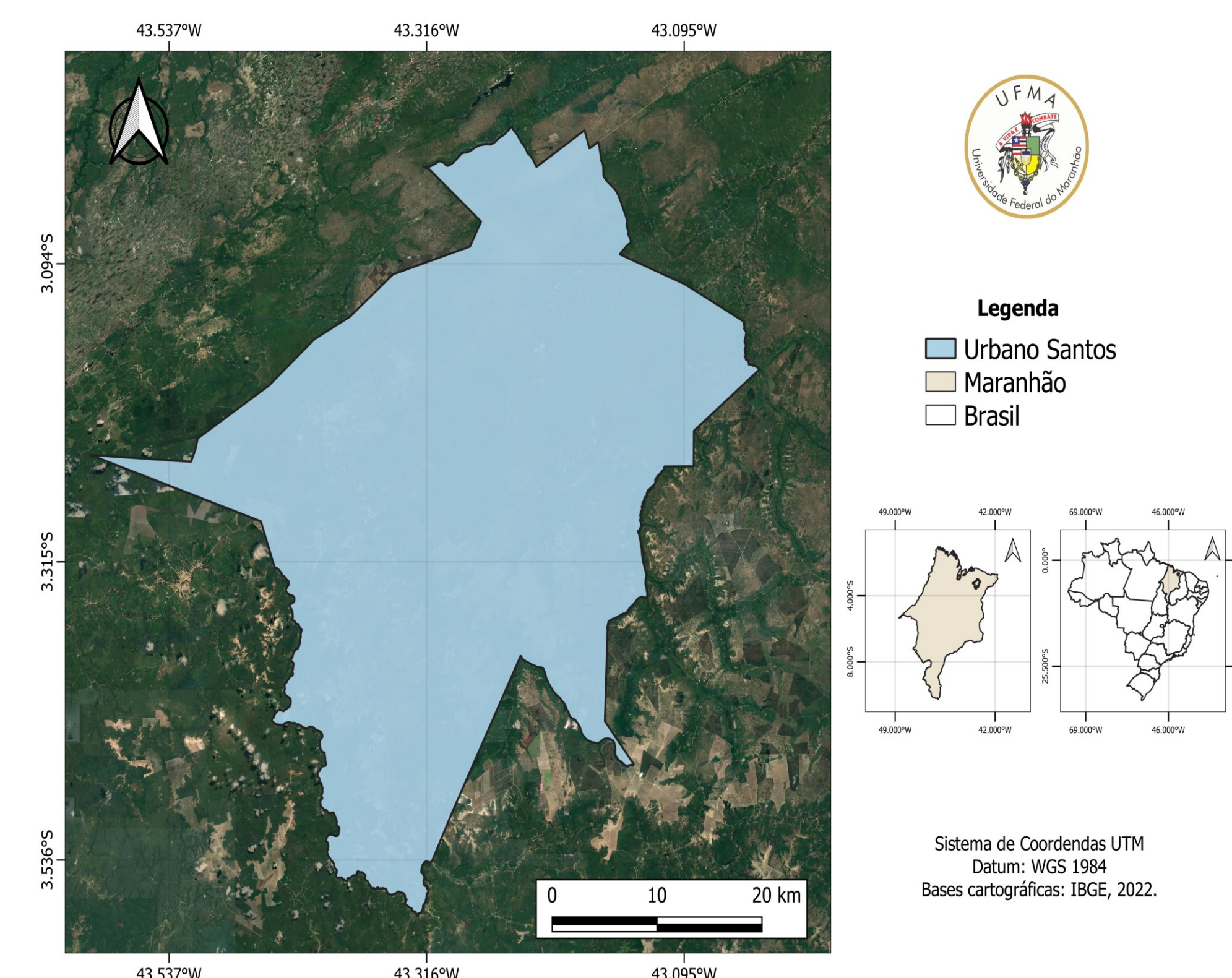
Research Methods

Planning Investigations

Describes the planning process

- The study encompasses the municipality of Urbano Santos, located in the eastern mesoregion of the Brazilian state of Maranhão (Figure 1). The region, covering an expanse of 1,208 km², was recorded to have a population of 33,495 by the Brazilian Institute of Geography and Statistics (IBGE) in 2022. The prevailing climate, classified as Aw by Köppen, has an average air temperature of 26°C and an annual average rainfall of 1,600 mm (Alvares et al., 2013; Corrêa et al., 2023). The main geomorphological feature is the Coastal Tablelands (Lopes et al., 2020).

Figure #1



Planning Investigations

Describes the planning process

- This project leverages the GLOBE Observer Land Cover protocol and NASA's tools to promote sustainable farming and protect Chapadinha's environment.
- Training workshops were held for IEMA students, led by previously trained UFMA monitors, with a focus on practicality for the students' context.
- Using UFMA's computer labs and MapBiomas Project Collection 8 data, satellite images were processed to examine land use changes in Maranhão.
- These images were categorized and analyzed in Excel®, looking at various land categories over 1985, 1995, 2005, 2015, and 2021 to measure the alterations in land use and cover.



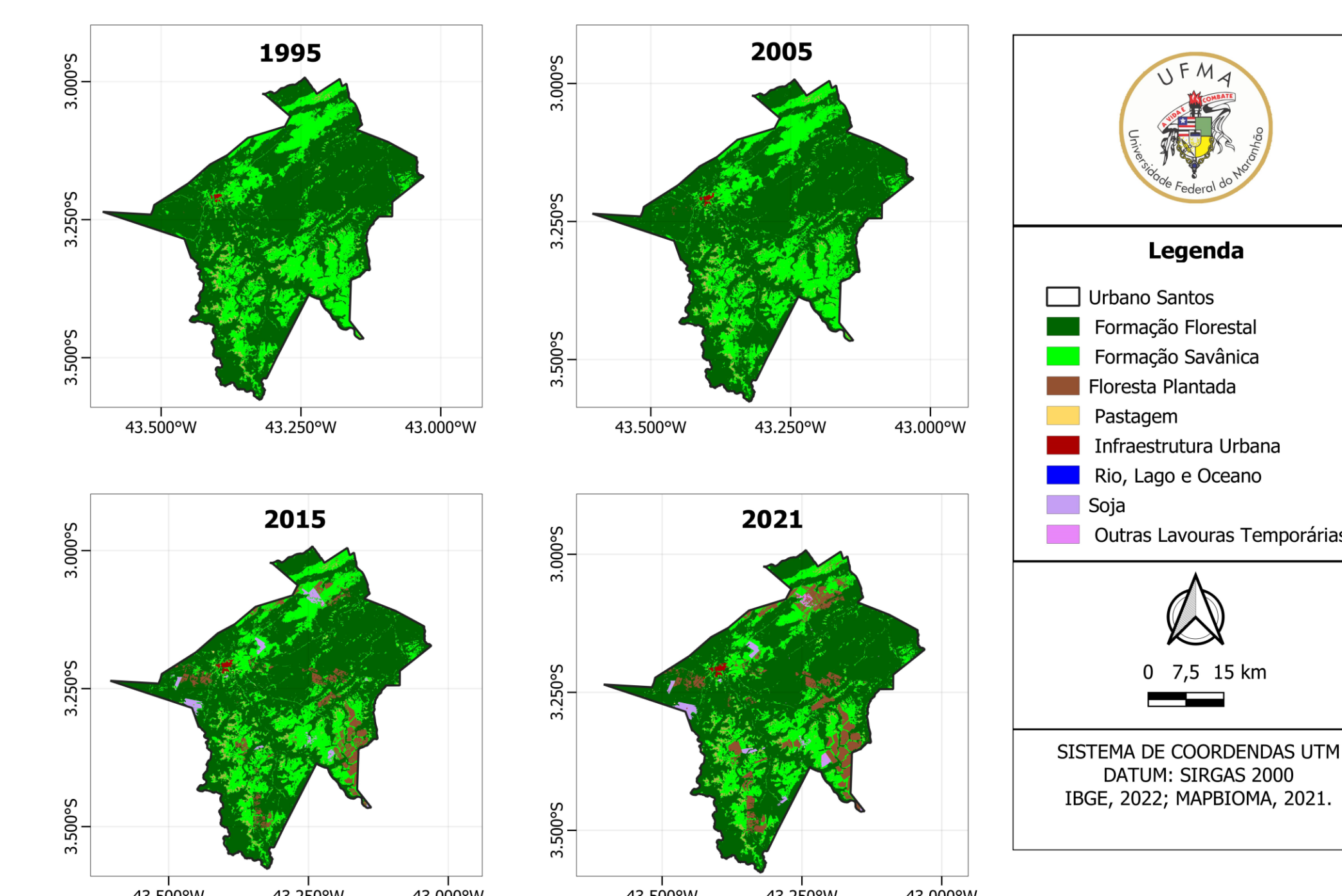
Field Photos

Results

Analyzing Data

- In 1995, Forest Formation covered virtually the entire land area of Urbano Santos, with 120,782 hectares. Urban Infrastructure was minimal at 0.16%, and there were no records of soy cultivation or temporary crops. Water bodies accounted for 0.14% of the area.
- By 2005, Urban Infrastructure had grown to 0.26%, while Forest Formation remained stable. Eucalyptus and soy cultivation emerged, and water body area decreased slightly to 0.12%.
- In 2015, Forest Formation had decreased to 95.21%, with significant agricultural expansion in Eucalyptus and soy, now occupying 1.68% of the municipality. Temporary Crops increased to 1.83%, and urbanization led to a decrease in water body areas.
- In 2021, urbanization and infrastructure reached 0.37%. Forest Formation further reduced to 6.40%, with a total loss of about 7,729 hectares over 26 years. Soy cultivation decreased slightly to 1.66%, while Temporary Crops expanded to 2.45%, representing a 749-hectare increase since 2015.

Figure #2



Discussion

Interpreting Data

- The results show significant changes in land use in Urbano Santos, with a decline in Forest Formation and water bodies, and growth in Urban Infrastructure and cultivation areas, indicating pressure on natural resources.
- The rapid development of urban infrastructure suggests economic expansion but raises environmental concerns.
- The expansion of Eucalyptus and soy plantations signifies a shift in the rural landscape and intensification of agriculture, with potential environmental and social impacts.
- Unregulated urbanization along rivers and lakes poses environmental and social risks.

Conclusions

Drawing Conclusions & Next Steps

- The municipality of Urbano Santos - MA has undergone significant transformations in the landscape and land use and cover during the assessed period. A marked state of progressive degradation of Forest Formation vegetation has been noted, occurring alongside a significant expansion of Urban Infrastructure. This phenomenon has paralleled the demographic growth of the local population. Moreover, rivers and lakes have been drastically affected, leading to changes that have negatively impacted the environment, with a substantial reduction in the expanse of these water bodies within the municipal territory. While soy cultivation initially experienced notable growth since its introduction in 2005, there has been a slowdown in its expansion, as evidenced by a 0.02% decrease in cultivated area compared to 2015, indicating potential shifts in the local agricultural landscape. Temporary Crops have seen rapid and seemingly disorganized growth, encroaching upon previously unused areas, which highlights the opening of new agricultural areas and the suppression of native vegetation.

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