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THE IMPORTANCE OF SOIL MAPPING FOR THE PLANNING AND MANAGEMENT OF GEOGRAPHIC SPACE. A CASE STUDY IN THE MUNICIPALITY OF TERESINA-PI.

A IMPORTÂNCIA DO MAPEAMENTO DE SOLOS PARA O PLANEJAMENTO E GESTÃO DO ESPAÇO GEOGRÁFICO. UM ESTUDO DE CASO NO MUNICÍPIO DE TERESINA-PI.

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ABSTRACT
This work aim to show the importance of creating and implementing soil mapping at appropriate scales, for better management and planning of the city of Teresina, Piauí. The research had a review approach, both in the literature and in the collection and analysis of spatial data. The results showed that the city of Teresina does not have adequate pedological mapping, which affects its planning and management.
Keywords: soils; maps; scales.

RESUMO
O presente trabalho busca mostrar a importância da criação e implementação do mapeamento de solos em escalas adequadas, para uma melhor gestão e planejamento da cidade de Teresina, Piauí. A pesquisa teve uma abordagem de revisão, tanto no âmbito da literatura quanto na coleta e análise de dados espaciais. Os resultados evidenciaram que a cidade de Teresina, não possui um mapeamento pedológico adequado, o que afeta o seu planejamento e gestão.
Palavras-chave: solos; mapas; escalas.

INTRODUCTION

Throughout history, humanity has established and interfered in various ways in the dynamics of the balance of nature, resulting over the decades in escalating impacts on the environment (Ross, 1994). The 20th century was significant for addressing these challenges, as it saw a more comprehensive focus on studying, understanding, and disseminating the need for mitigating environmental impacts. In this context, there was an increase in awareness about the impacts of human actions on the balance of biodiversity and geodiversity, which began to be part of discussions in forums and normative documents planning governmental entities.

In Brazil, this scenario followed a similar path, although it happened later, with aspects related to biodiversity receiving more emphasis than those related to geodiversity. On the other hand, pedodiversity, which is a sub-branch of geodiversity, began to be developed empirically through soil surveys starting from the 1940s and were expanded with the creation of governmental organizations such as the Brazilian Agricultural Research Corporation (EMBRAPA) and also through technological advancements (Carvalho; Nunes; Antunes, 2013).

Despite the production of numerous works within this theme (such as the RADAMBRASIL Project), which were and are of extreme importance for understanding the diversity and location of soil orders in Brazilian territory, there are still gaps that can and should be improved, especially when considering the scales and levels of detail of the surveys. In addition to the limited production of more detailed maps, another issue is the underutilization and implementation of these maps by both the public and private sectors, directly affecting the organization and containment of socio-environmental impacts.

The state of Piauí, like other federative states, fits into this reality of pedodiversity, considering that the scale displayed on maps addressing this topic is exploratory and does not encompass the diversity of soil orders present in the geographic space. This situation is also present in the municipality of Teresina, which, despite having a more detailed

pedological mapping (Moraes, 2004) resulting from a master's dissertation, is relatively unknown to academic circles and is scarcely used by the government.

Therefore, presenting this adversity that directly affects the planning and management process of urban and rural areas. This paper aims to highlight the relevance of soil mapping as a tool to understand the reality of soil orders in the municipality of Teresina, Piauí, as well as its importance for territorial management.

MATERIALS AND METHODS

Characterization of the study area

The study is focused on the municipality of Teresina, the capital of the state of Piauí, with geographical coordinates of 5°05'12" S and 42°48'42" W. The city is located in the inter-river region, approximately 349.6 km away from the coastline, making it the only capital in the Northeast not bordered by the ocean, covering an area of 1,391.293 km2, according to the 2021 estimate from IBGE.

With an estimated population of 871,126 inhabitants according to IBGE 2021, Teresina has a tropical climate characteristic, with less rainfall in winter than in summer, classified according to Köppen and Geiger as Aw (tropical savanna climate), with March having the highest rainfall index. Furthermore, in terms of geological aspect, Teresina is situated on the "Pedra de Fogo" formations, primarily composed of sandstones, siltstones, and shale, and the "Piauí" formation, mainly consisting of reddish and whitish sandstones, both formations belonging to the Balsas Group.

Additionally, as stated by Lima (2016), the capital has three basic forms in the urban territory: plains and alluvial terraces; surfaces intensely reworked by drainage with residual hills; and hills, with tendencies towards rounding, limited by stepped relief. Regarding the types of soils present in the Piauí capital, according to the available maps, there is a predominance of latosols and argisols (Moraes, 2004). However, upon a more in-depth analysis, the city exhibits a broader pedological diversity, as field studies have observed a variability of soil orders not present in governmental reference maps.

METHODOLOGY

The methodology used in the construction of this work consisted of a bibliographic survey in reference journals available on digital platforms such as Google Scholar, Capes Periodicals, and Scielo, as well as government websites, using the following keywords: "soil, pedology, Teresina, mapping." This action aimed to obtain data on the state of the art in the study area. Subsequently, the acquired information was compared with the reality of the municipality.

RESULTS AND DISCUSSION

Soil Mapping

Based on research conducted on governmental websites (IBGE, EMBRAPA, and Teresina Municipal Government), it was found that there is a mismatch between what the theory presented in technical works advocates and the reality of the analyzed maps of the municipality. The scales present in the IBGE range from 1:1,000,000 to 1:250,000. EMBRAPA provides isolated and punctual descriptions of locations in Teresina on a 1:10,000 scale, but there is also a map on a 1:1,000,000 scale, and the municipality's website does not contain pedological maps.

Thus, it was evidenced that the scales used in governmental maps do not offer sufficient detailing of the soil orders present in Teresina's geographical space since they present mapping scales that are not suitable for good municipal planning, as they fall into the exploratory category (1:250,000 to 1:1,000,000). The ideal for achieving better effective knowledge would be maps with scales of 1:25,000 to 1:50,000, which fit into semi-detailed maps (Oliveira et al., 2007).

However, this information has already been improved by Moraes (2004) through the construction of a map with a medium-intensity recognition scale (1:100,000). However, it is observed that its use is little explored, as since its publication (2004) until the present moment, there are only 6 works that have used its data, according to Google Scholar.

Such findings, although representing an environmental problem from the perspective of planning and management of Teresina's geographical space, reflect the reality present in much of Brazilian territory. As Demattê et al. (2001, p. 1382) point out, "Only 5% of the land surface has been mapped at a scale of 1:25,000, 15-20% at 1:100,000, and 35% at

1:250,000." Within this perspective, Demattê et al. (2004, p. 1221) highlight that "With the increasing environmental concern, there is a need for monitoring natural resource conditions," which is further intensified due to the overall degradation caused by climate change in recent times, affecting the environment among various categories, with soil being a significant element of the abiotic environment that interacts with and is more susceptible to human actions, as pointed out by Ross (1994).

In this context, it can be argued that many of the urban and rural problems in the geographical space have a significant contribution from the lack of in-depth knowledge of this element (soil). Thus, flooding, landslides, contamination of aquifers, silting, severe erosion, and loss of productive areas, which are already common events in the municipality of Teresina, could be better contained and predicted with the contribution and implementation of more detailed pedological cartographic surveys.

CONCLUSIONS

Considering the discussed theme and the results obtained throughout the research, it can be seen the vital contribution that soil mapping on a semi-detailed scale has for the planning and management of Teresina's geographical space. Therefore, there is an urgent need for the elaboration and subsequent dissemination of pedological maps on scales that are more representative of the reality of Teresina's soils, given that the current situation presents scales that provide information at a medium intensity and exploratory level. Even the work carried out on a 1:100,000 scale has been underutilized in territorial management. Thus, it is noteworthy to emphasize that in the context in which Teresina is classified, with progressive urban sprawl and occupation of geographical space, actions proposed and carried out without knowledge and appreciation of soil characteristics represent a problem that directly affects and intensifies socio-environmental impacts, especially those resulting from climate change.

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