

## Urbanization Impacts on Water Bodies in the city of Apucarana-PR (Brazil)

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### Highlights:

- Study highlights impacts of human actions on water bodies in Apucarana.
- Urban expansion reaches drainage headwaters and watercourse sources.
- Photographic records reveal the challenges of urbanization in Apucarana.

Keywords: Urbanization, Permanent Preservation Area (APP), Water Bodies.

## INTRODUCTION

Understanding the relationship between society and nature is essential for comprehending the direct and indirect transformations in natural and urban spaces. Water bodies are fundamental elements in the construction of urban landscapes and hold great environmental, economic, cultural, and aesthetic value.

A practical example of the relationship between anthropogenic activities and impacts on water bodies can be observed in Apucarana, located in the northern region of the state of Paraná (Brazil), with a population of 130,134 inhabitants (IBGE, 2022). It is approximately 365 km from the state capital, Curitiba. The presence of springs in urban areas combined with the constant population and territorial growth, highlights the importance of preservation, requiring detailed studies that consider the influence of urban activities and the pressure exerted on the water bodies present in the city. The objective of this work is to present the impacts resulting from anthropogenic actions on the water bodies present in the urban area of the city of Apucarana.

## METHODOLOGY

To analyze the impacts caused by human alterations on water bodies in the study area, a methodology was developed that combined geospatial analysis, local selection, and field visits for direct observation. The first step involved creating a map using QGIS geoprocessing software with satellite images and overlaying layers showing the distribution of water bodies in Apucarana, PR. Several studies highlight



the importance of using geoprocessing tools to identify and monitor environmental impacts in urban areas (FIORESE, 2021; NAYAN et al., 2020; HALL & HOSSAIN, 2020). The construction of the map, along with prior knowledge of the region, allowed the identification of urban areas near the water bodies. Field visits were conducted to photograph and document problems from urbanization. This approach enabled direct observation of key impacts, making the effects of urbanization tangible and highlighting areas most susceptible to urban impacts on water bodies.

## RESULTS AND CONCLUSIONS

To contextualize the analysis of urban impacts on water bodies, it is essential to understand the spatial distribution of the visited locations and the observed anthropogenic activities. Figure 1 shows the location of the visited points and the records of the anthropogenic actions found at these locations.

Figure 1. Study Locations and Photographic Records



The *Parque da Raposa*, location 1, is a Conservation Unit with a dammed lake that requires ongoing maintenance to prevent bank siltation (SOBRINHO, NIGRO, 2014). Despite these efforts, siltation persists due to sediment transport from soil erosion, reducing the lake's depth and increasing flood risks. Previous studies highlight that unregulated urbanization and lack of riparian vegetation are key factors in siltation (WEN et al., 2021). Geospatial analysis confirms high urban pressure in the area, underscoring the need for interventions to address these issues.

At *Lago Schmidt*, location 2, various issues related to urban pressure were noted, including fluvial erosion, a dam in poor condition, and irregular occupation in the Permanent Preservation Area. The observed erosion aligns with studies showing that urban development exacerbates erosion, particularly where vegetation is removed for construction. Irregular occupation along the lake's margins is common in urban areas, where expansion often encroaches on sensitive environments (WEN et al., 2021). Field photographs confirm these issues and a review of land use policies highlights inadequate enforcement and lack of integrated water resource management in the region.

The *Ribeirão Biguaçu* area, location 3, is situated between two parks: *Parque São Francisco de Assis* and *Parque da Bíblia*. The anthropogenic intervention in the region is evidenced by the channelization of the stream, which was implemented to address the frequent erosion processes in the area around the 1970s (TORRES, 2014; FARIA, 2007; FERREIRA, 2006). Field observations revealed that the channelization led to altered hydrological patterns, including changes in runoff and sediment load, suggesting that despite the modifications, the channelization had a positive impact on mitigating erosion in the region.

The *Praça dos 70 Anos* area, location 4, emerged from a restoration project aimed at revitalizing the *Córrego Jaboti*. This area is situated within an urbanized zone, where anthropogenic activities have led to significant environmental changes. The lack of natural vegetation along the stream's banks, combined with urban infrastructure, has contributed to issues such as pollution and erosion (HALL & HOSSAIN, 2020). Field visits confirmed the presence of these impacts, highlighting the need for improved urban planning and sustainable practices.

The *Parque do Jaboti* area, location 5 features an artificial lake formed by the confluence of *Água da Lagoa*, *Jaboti*, and *Barra Nova* streams. Water quality here is compromised by fecal contamination and *Escherichia coli*, as shown in previous studies (SCHUBERT, MIKALOUSKI, 2019). Situated in an urban zone, the park's pollution aligns with urban lake assessments, where inadequate sewage systems and runoff contribute to contamination (WEN et al., 2021; TERNUS et al., 2011). Field observations indicate ongoing pollution, likely from domestic effluents and animals in the contributing streams.

The source of the Pirapó River, location 6, The source of the Pirapó River, location 6, is situated in an urban area and is not shown on official maps due to its underground flow. The lack of protective boundaries and the soil's low compaction allow rainwater infiltration (GRIZIO and CANEZIN, 2018). Geospatial analysis showed significant urban pressure at the site. The absence of protective vegetation and ongoing urbanization threaten the water quality and ecological integrity of the Rio Pirapó (CESSSEL et al., 2019). Field visits documented these issues, with photographs depicting the degradation of the spring area.

The analysis of various locations in Apucarana revealed the complex impacts of urbanization on the city's water bodies. Results emphasize the need for sustainable management and integrated urban planning. While some interventions have addressed specific issues, urban expansion still exerts significant pressure on water resources. Implementing policies that balance environmental preservation with urban development is crucial for protecting water quality and ecological integrity.

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