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Canalized urban rivers: the Biriguizinho Stream, in Birigui/SP

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SUMMARY

The Biriguizinho Stream, like so many other urban rivers, has undergone changes over the years, with the correction of its banks, channeling and suppression of its source. These measures were seen as the most adequate to enable the urban growth of Birigui-SP. However, with the passage of time and expansion without predetermined guidelines, episodes of flooding occur in the region of the aforementioned stream, overloaded with the runoff of rainwater from a large part of the city. The purpose of this article is to analyze the factors that contribute to flooding on the banks of the Biriguizinho stream, in the city of Birigui/SP, with the aim of proposing green infrastructure solutions that mitigate or definitively affect floods, avoiding risky situations. The methodological procedures adopted include readings on the themes of urban rivers, landscape, perception, risks, and green infrastructure, in addition to observation of the study area.

KEYWORDS: Urban Rivers. Floods. Green Infrastructure.

INTRODUCTION

Brazilian cities were initially established in coastal areas of the northeast, south and southeast. The advance towards the upstate city was intensified with the navigability of rivers, the discovery of gold and precious stones (where miner camps were consolidated as cities), the sale of cattle and deforestation for planting whose product would be transported by the railways (MARX, 1980).

Urbanization, in most cases, is a process lacking in planning, driven by real estate speculation and the financial interests of those who have sufficient monetary resources (SILVA, 2020). It accelerates the results of environmental impacts and modifies the terrestrial geography, since man, despite composing the ecosystem, began to act as if he were an alien part of the environment, trying to overcome it and extract its resources in a dominant way (DREW, 2005). Such parameters can lead to the consolidation of poorly designed cities, with serious problems in the functioning of their systems and disagreements regarding the geographic environment in which they are located.For citations, the author must follow the recommendations of ABNT. In the case of direct citations with more than three lines, 4 cm of the paragraph should be highlighted. Spacing between lines should be simple.

The main natural resources that are damaged by the urbanization process are the original vegetation and watercourses. Human actions tend not to prioritize such elements. It is common not to find the vegetation prior to the urbanization process and to have urban streams and rivers suppressed or canalized. This is the case of the Biriguizinho stream, in the city of Birigui, in the state of São Paulo.

Birigui began with the passage of the Noroeste do Brasil Railroad (NOB). The intention was to sell land for planting. The first buildings were built in the closeness of where the former railway station was. The region is crossed by the Biriguizinho stream, but at the time there was some resistance to occupying its banks.

Silva (2020), who studied the urban expansion of Birigui/SP, reports that in 1952 there were already twenty-two neighborhoods in the city. The author explains that the city's growth is linked to endogenous industrialization (which occurred in the 1960s), to the industrial decentralization process in the city of São Paulo (intensified in 1980) and to the new phase of Brazilian urbanization, aimed at small and small cities. medium-sized, reinforced after

the 1990s. The combination of these elements changed the landscape and generated visible damage, such as floods, and invisible at first, such as erosion. As a result, living, working or transiting through such a region can represent a risk to the inhabitants of Birigui.

The concept of risk, in the words of Vargas (2006) and based on the technical-quantitative approach, corresponds to an adverse situation, an activity or a physical configuration that presents objective probabilities of causing damage. These can be estimated by calculating acceptability levels, establishing standards through various methods. The author considers that there is a high demand for measuring and calculating the consequences of possible events.

Guivant (2000) talks about the perception of risks by lay people and qualified inspectors. For the first group, perceiving the risk is linked to intuition and finding facts (after complications). This is because there is a lack of technical knowledge, which would not happen with the second group. Being closely linked to the technique of identifying risks, he manages to predict and justify them through methods, which increases the chance of assertiveness in the forecasts, but does not undermine the knowledge of the population that lives in the area. It just turns out that different methods can lead to different results and evaluations.

Spink (2014) brings together the probability of risks with psychosocial factors that may justify the permanence of residents in this area. In their study, there was research on Federal Law 12,608, of April 10, 2012, corresponding to the institution of the National Civil Defense and Protection Policy. Understanding it contributes to the understanding of the competences of Civil Defense and also the risk parameters that help to map the passive territories of its action or other public policy. This understanding led to the determination of the study area and subsequent approximation from the perspective of local residents. The author identified that the landscape and the risk that it presents are the result of several factors, such as lack of attention and respect for geographic characteristics, poor planning or the type of project that does not bear good results, should be corrected as soon as possible. , in addition to the social gaps that only aggravate with the aforementioned measures. She also highlighted that staying in such regions has a lot to do with the “priority of risks”, a concept discussed by other authors that can be applied to different areas of study. The idea is that, once the danger is verified, it may not yet be the person's primary concern, perhaps losing out to the inexistence of alternative housing and the lack of resources for the minimum human needs.

The variables are well delineated by Tuan (1980), when bringing the concept of perception, considering that it can be individual or collective, and bringing with it several factors, also individual and collective, such as memories, culture and experiences. The author emphasizes topophilia, which is the symbology that a place can have for a person or a group, in addition to being what makes the act of living and occupying spaces transcend and re-signify, regardless of whether they are urbanized or not. As the contingent of human activity is greater in cities, there is greater complexity and interest in studying them (CORRÊA, 1989).

Considering the risk areas along the streams, green infrastructure presents itself as a path to urban resilience. In addition to the concern with the environment and the use of natural resources in a sustainable way, it foresees the re-encounter of these with the human being, so that they coexist harmoniously (BENINI and CONSTANTINO, 2017). In relation to the

current situation of the streams and their banks, what can be done is to look at the landscape as it is and establish solutions for the existing problems.

OBJECTIVE

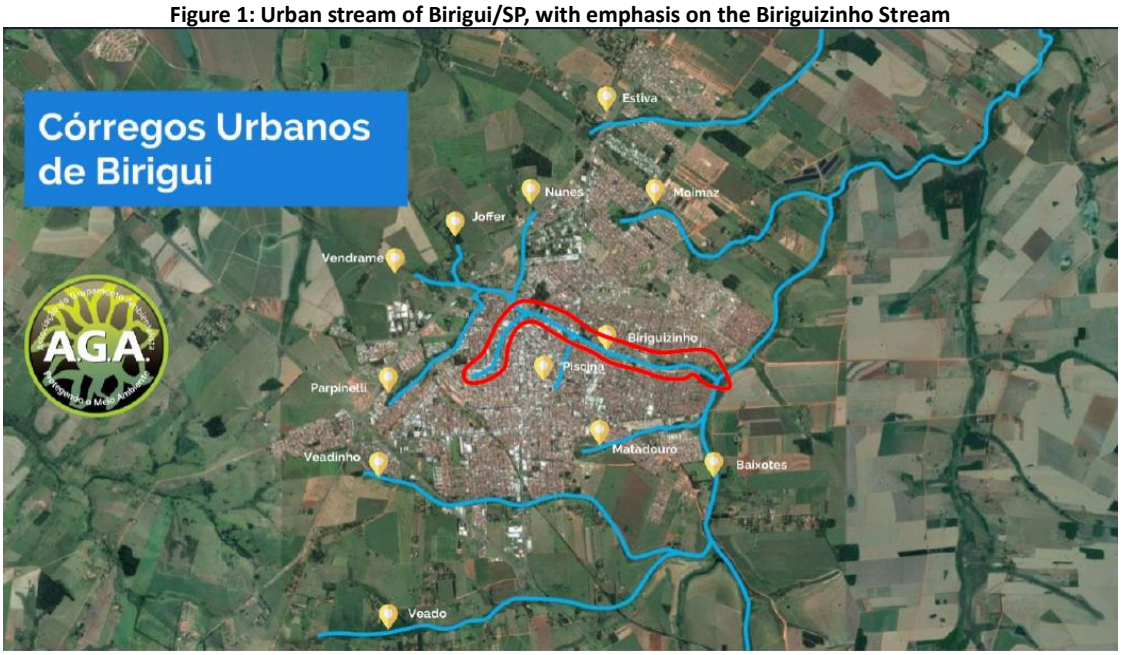
This article aims to analyze the factors that contribute to flooding on the banks of the Biriguizinho stream, in the city of Birigui/SP, with the aim of proposing green infrastructure solutions that mitigate or definitively affect flooding.

METODOLOGY

In order to achieve the above-described objective, readings and listings of the respective themes were carried out in order to then carry out comparisons and applications of the concepts in the reading of the landscape in question.

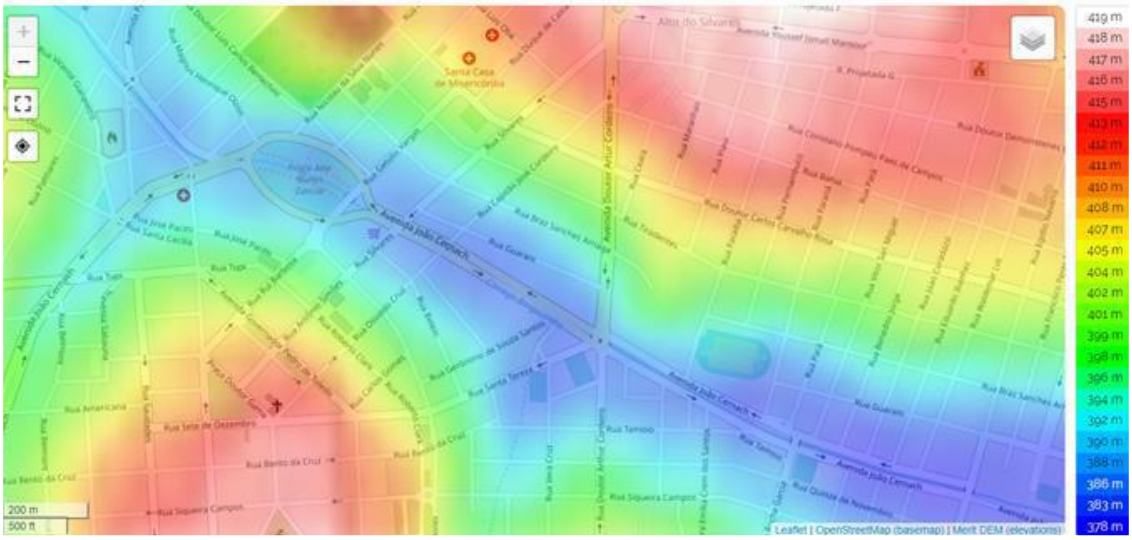
Subsequently, a geographic cut was chosen based on the identification of the region that suffers the most from flooding. The choice was made through the observation of the place on rainy days and the news found in newspapers and websites over the years of consolidation of the municipality. Added to this are the facts that the course of the stream is the lowest region of the city (elevation 378m), the confluence of two other streams (Córrego da Piscina and Córrego Vendrame, visible in Figure 1) and streets with slopes accentuated and perpendicular to the valley floor, which increases the speed of rainwater, overloading the urban drainage system (Figure 2).

Figure 1: Urban stream of Birigui/SP, with emphasis on the Biriguizinho Stream



Source: https://prezi.com/view/fMHfStjxzDFkSH6EYaOj/, with the author's intervention, 2021.

Figure 2: Map with the maximum and minimum altitudes of Birigui



Source: https://pt br.topographic map.com/maps/g531/Birigui/, 2021.

The source of the stream is in a middle-class residential region; from there, the stream passes through the city's commercial center and through a low-income residential area, heading to the rural area, where it flows into the Ribeirão Baguaçu. Throughout its length (5.12 km), Biriguizinho receives the runoff of rainwater and this overload is what generates the flooding.

The area most affected by the floods is made up of businesses, homes and public institutions. In Figures 3 and 4 the same area is depicted, but in the rainy season and in the sunny season, respectively.

Figure 3: Image of the studied region on a rainy day

Source: https://www.facebook.com/biriguiwebnews7/videos/1857137417647402, 2017.

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Figure 4: Image of the studied region on a sunny day

Source: https://www.google.com.br/maps/@21.2856832,50.3439755,3a,65.8y,144.82h,86.08t/data=!3m6!1e1!3m4!1sSNkraRx4yiIFOQMENVJYvA!2e0!7i16384!8i8192?hl=ptBR&authuser=0, 2021.

RESULTS

Currently, for the creation of new neighborhoods it is required that rainwater is not sent to the Biriguizinho stream. The city government suggests to new subdivisions that they take measures to contain these waters and/or their destination for rural areas. An example of this measure is the Condomínio Residencial Boa Vista, where rainwater is directed to a rural area on the same road (Rodovia Senador Teotônio Viléla, Figure 5). It is still regulated that there is a permeability rate of 10% (ten percent) of urban lots, except commercial lots and some condominiums, where this rate can be higher depending on each regulation.

Figure 5: Regions of the Residential Condominium Boa Vista and the area of destination of its rainwater

Source: Google Earth, with the author's intervention, 2021.

There is discussion of the possibility of instituting laws that regulate each lot to store and use the rainwater that falls on its perimeter. Such storage implies carrying out properly adequate installations, which do not cause damage to the location or the surroundings and that its system allows the reuse of the resource for irrigation and/or cleaning. The measure would prevent a large contingent of water from reaching the stream at the same time, overloading it. Furthermore, the reuse of water is a sustainable act, making it possible to take advantage of a scarce and wasted resource.

Another measure is to create public roads with permeable areas and/or with water containment to delay its arrival in the valleys, where flowerbeds could be created that would divert rainwater into public sidewalks, treat it through vegetation purifying the water and return them to the gutter with less impurities, avoiding polluting rivers or clogging up wolves, lions and galleries.

Some cities have been discussing that, in stretches not yet occupied along the banks of urban rivers, it is possible to create linear parks with Permanent Protection Areas - APP and give a new chance for the original vegetation to be replanted, while the soil remains permeable to receive the rainwater and the stream have its course preserved by reducing the chances of silting. In Birigui, a linear park was created on the bank stretch not yet occupied by asphalt or constructions (Figures 6 and 7). However, the project is unfinished. The proposal foresaw the installation of a fence to preserve the banks of the stream and the newly planted vegetation in order to reconstitute a riparian forest with native plants (Figure 8). The area has not been fully fenced and you can see it has not been maintained. There are stretches showing erosion (Figure 9), in addition to the undue occupation of stretches where courts for sports practice would be placed (which were not performed) (Figure 10). Even so, it is possible to observe that the stream bed, in this part, is wider and has a permeable margin (Figure 11).

Figure 6: Demarcation of the linear park area

Source: Forest restoration project in the Biriguizinho Stream hydrographic basin – Birigui/SP, March, 2018.

Figure 7: Linear park nameplate

Source: The authoress, 2021.

Figure 8: Riparian forest recomposition vegetation

Source: The authoress, 2021.

Figure 9: Eroded area

Source: The authoress, 2021.

Figure 10: Area initially intended for recreation and leisure

Source: The authoress, 2021.

Figure 11: Margin of the Biriguizinho stream within the linear park

Source: The authoress, 2021.

FINAL CONSIDERATIONS

The readings and observation of the region show that solving the problems with increasing floods begins with promoting the reintegration of man into the environment, whether urban or rural. For both to exist simultaneously, they coexist in a sustainable way, respecting their interdependence. In this way, cities will be planned with higher quality, bringing less negative impact to the environment and prolonging the existence of natural resources, so important for subsistence and for human activities. Birigui is one of the many cities that need a study of macro-drainage and public policies that integrate environment and development. The rivers suffered many denials and clamor for acceptance, not only for the continuity of their existence, but for the improvement of life in urban areas.

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