Revista Latino-americana de Ambiente Construído & Sustentabilidade
Revista Latinoamericana de Ambiente Construido y Sostenibilidad
ISSN 2675-7524 Suporte Online / Online Support
Edição em Português e Espanhol / *Edición en Portugués y Español* - v. 5, n. 21, 2024

A importância do paisagismo na faixa de domínio em áreas urbanas: o caso da implantação de projeto paisagístico na faixa de domínio da BR-376 entre o km 181+290 e o km 181+430 lado direito, área urbana de Maringá-PR.

The importance of landscaping in the right of right in urban areas: the case of the implementation of a landscaping project in the right of way of BR-376 between km 181+290 and km 181+430 on the right side, urban area of Maringá-PR.

La importancia del paisaje en el derecho de derecho en áreas urbanas: el caso de la implementación de un proyecto de paisajismo en el derecho de vía de la BR-376 entre el km 181+290 y el km 181+430 del lado derecho, área urbana de Maringá-PR.

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Revista Latino-americana de Ambiente Construído & Sustentabilidade
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Leo.souza0190@gmail.com**RESUMO**

O paisagismo rodoviário no Brasil ainda necessita de uma política que valorize essa importante atividade, não só como resgate de recuperação ambiental, mas também pela função estética e de segurança. Desta forma, realizando a integração da estrada à paisagem, além de contemplar a importante missão da arquitetura paisagística, cumpre o papel de salvar vidas mediante a adoção do uso da vegetação como função de segurança, auxiliando na sinalização das rodovias e proporcionando maior conforto, segurança e bem-estar aos seus usuários. Este estudo teve como finalidade intervir nas áreas ociosas e sem devidos cuidados da faixa de domínio que transpassa as áreas urbanas, pela implantação de um projeto de paisagismo por meio dos espaços verdes com a função estética, ambiental, social, bem como de segurança da rodovia na faixa de domínio da BR-376 - km 181+290 ao km 181+430, lado direito na área urbana de Maringá-PR. Como metodologia de pesquisa foi utilizada uma abordagem qualitativa que tem o ambiente modificado como fonte direta dos dados e o pesquisador como instrumento-chave, entendendo as relações e mudanças do meio e tentando intuir as consequências e criando deliberações para o espaço. Foi possível verificar e demonstrar a importância do paisagismo no sistema rodoviário, por meio dos benefícios como vitalidade ao espaço, inclusão de espaço ocupado pela faixa de domínio da rodovia à cidade, reconstrução dos espaços verdes, contribuindo com o ecossistema e beneficiando a sociedade-natureza.

PALAVRAS-CHAVE: Intervenção. Paisagística. Canteiro.

SUMMARY

Road landscaping in Brazil still requires a policy that values this important activity, not only as a means of promoting environmental recovery, but also for its aesthetic and safety functions, integrating roads into the landscape. Furthermore, it must consider the essential mission of landscape architecture, which plays a vital role of saving lives by using vegetation for safety purposes, enhancing highway signage and providing comfort, safety and well-being to its users. This study aimed to address neglected areas within the right-of-way that cross urban regions, with the objective of implementing a landscaping project that integrates green spaces with aesthetic, environmental, and social functions, as well as improving highway safety on BR-376 right-of-way - km 181+290 to km 181+430 on the right side, in the urban area of Maringá - PR. In this sense, the study was carried out through a qualitative approach treating the modified environment as a direct source of data and positioning the researcher as a key instrument, analyzing relationships and environmental changes while predicting the consequences and creating strategies for the space management. The findings demonstrated the significance of landscaping in road systems, providing benefits such as revitalizing space, integrating highway right-of-way areas into the city, and restoring green spaces, thereby contributing to the ecosystem and benefiting both society and nature.

KEYWORDS: Intervention. Landscaping. Flowerbeds.

RESUMEN

El paisajismo vial en Brasil todavía requiere una política que valore esta importante actividad, no sólo como un medio para promover la recuperación ambiental, sino también por su función estética y de seguridad, integrando las carreteras al paisaje. Además, debe contemplar la misión esencial de la arquitectura paisajística, cumpliendo así con el importante rol de salvar vidas adoptando el uso de la vegetación como función de seguridad, mejorando la señalización vial y brindando comodidad, seguridad y bienestar a los usuarios. Este estudio tuvo como objetivo intervenir áreas desatendidas del derecho de vía que atraviesa zonas urbanas, con el objetivo de implementar un proyecto paisajístico que integre espacios verdes con funciones estéticas, ambientales, sociales, y de seguridad vial, con el objetivo del proyecto paisajístico implementado en el derecho de vía de la BR-376, desde el km 181+290 hasta el km 181+430 em el lado derecho del área urbana de Maringá, Paraná. En este sentido, el estudio utilizó un enfoque cualitativo, considerando el entorno modificado como fuente principal de datos y al investigador como instrumento clave, entendiendo las relaciones y cambios en el ambiente, e intentando prever las consecuencias y creando estrategias para la gestión del espacio. Los resultados demostraron la importancia del paisajismo en el sistema vial, a través de beneficios como la revitalización del espacio, inclusión del derecho de vía en la ciudad, reconstrucción de espacios verdes, contribuyendo así al ecosistema y beneficiando tanto a la sociedad como a la naturaleza.

***PALABRAS CLAVE**: Intervención. Paisajística. Parterres.*

1 INTRODUÇÃO

Road landscaping in Brazil still requires a policy that values this important activity, not only for environmental restoration, but also for its aesthetic and safety functions, thus integrating the road into the landscape. This leads to the reconstruction of green spaces in strips of land destroyed during the construction of motorways and their reintegration into nature (LIMA, 2016). In addition to its aesthetic, psychosocial and ecological functions, living signage provides more effective road safety.

Landscaping the road system refers back to the concept of landscape, which Macedo (1999-p.11), in his work “Landscape Design in Brazil”, defines as “the morphological expression of the different forms of occupation and, therefore, transformation of the environment in a given time”.

However, road landscaping is not just about beautifying green spaces on the roads; it also plays an important role in road safety. It can therefore be said that vegetation is fundamental to the road system, both in terms of its aesthetic function and in terms of environmental rescue and road safety.

The right-hand lane of the BR-376 motorway, in the stretch that passes through the urban area of Maringá, with medians between the dual carriageway and the marginal roads, in the Maringá-Sarandi direction, km 181+290 to km 181+430, initial UTM geographic coordinates: 408750.00 m E and 7408742.00 m S; and final: 408867.00 m E and 7408670.00 m S, was composed of empty spaces that lacked proper care.

In view of the above, the legal entity IPR - *Administradora de Bens Próprios*, which owns the petrol station next to the right-of-way on this stretch, proposed to DER/PR that this area be occupied by implementing a landscaping project on the roadbed, as well as its maintenance and preservation after the landscaping intervention.

The aim of the project was to transform the median into a space with both an aesthetic function and an environmental and safety function for the motorway, so that children and adults can move around freely and safely.

Corroborating Lima (2016), in a landscaping study for motorways, the use of compact hedges of shrubs is recommended for the central medians of dual carriageways, to reduce glare from the headlights of oncoming vehicles. The use of trees is not recommended due to the risk of collision with their trunks.

In this respect, therefore, road landscaping projects differ from those commonly found and developed for the urban environment, since those that cross urban areas in particular must include an association of aesthetic, environmental, social and safety functions, harmoniously integrating the road system with the urban system.

With this in mind, the landscaping project proposed for the strip of land between the central median and the BR-376 dual carriageway, within the urban stretch of Maringá, was designed for the exclusive use of herbaceous and shrub species, unless some other native species were used.

Revista Latino-americana de Ambiente Construído & Sustentabilidade
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2 OBJECTIVES

2.1 GENERAL OBJECTIVE

To intervene in idle and neglected areas of the right-of-way crossing urban areas, with the aim of implementing a landscaping project through green spaces with an aesthetic, environmental and social function, and improve safety on the motorway, taking as an example the case of the landscaping project implemented on the right-of-way of BR-376 - km 181+290 to km 181+430, in the urban area of Maringá-PR.

2.2 SPECIFIC OBJECTIVES

- To diagnose the natural resources of the study area: soil, vegetation, climate, rainfall, environment, and socio-economic issues of the region and urban area.
- Demonstrate the importance of integrating the motorway's right-of-way into the landscape, resulting in the reconstruction of green spaces and their reintegration into society/nature.
- Implement a landscaping project that aligns with the natural resources, socio-economic, and environmental realities of the region and urban area, such as the landscaping project implemented on the right-hand side of the BR-376 motorway - km 181+290 to km 181+430, in the urban area of Maringá-Pr.

3 METHODOLOGY

The study of the right-of-way area of the BR-376 motorway, which runs through the urban area of Maringá, with flowerbeds between the dual carriageway and the local marginal road, on the right-hand side of the motorway in the direction of the city of Sarandi PR, located between km 180+263 and km 180+416 (see Figure 1), was carried out using a qualitative approach, with the modified environment as the direct source of data and the researcher as the key instrument, understanding the relationships and changes in the environment, trying to intuit the consequences and creating deliberations for the space.

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Revista Latinoamericana de Ambiente Construido y Sostenibilidad
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Figure 1 - Location of the landscaped area on BR-376, km 180+263 - 180+416 -LD.

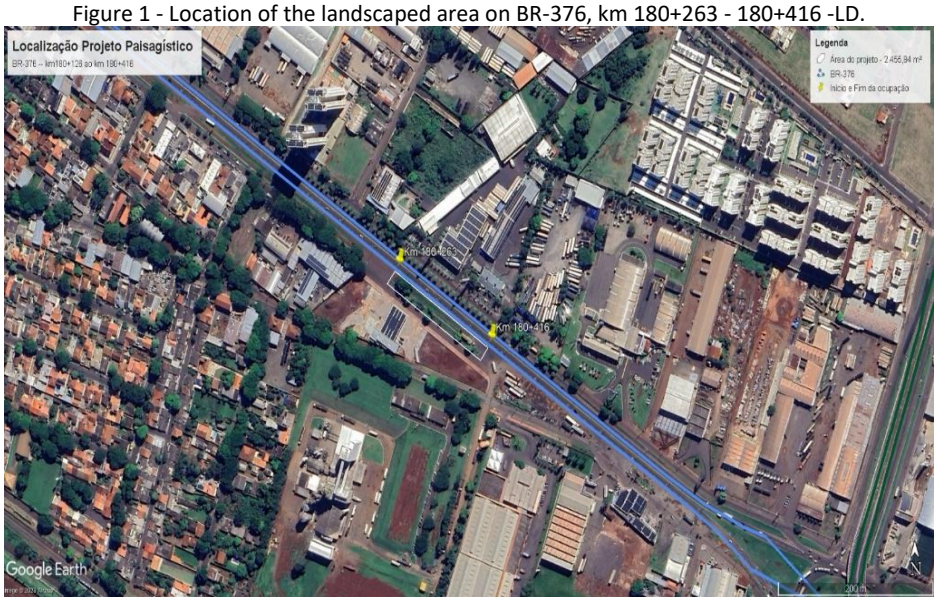

Image source ·: Google Earth, 2023.

The use of this approach allowed a deeper investigation into the issues related to the phenomenon under study and its relationships, by maximizing the value of direct contact with the situation studied, seeking commonalities while remaining open to perceiving individuality and multiple meanings (GIL, 1999).

This research was based on bibliographical reviews of books, journals, articles, dissertations, theses and technical instructions and legislation on the use and occupation of the DER/PR's right-of-way lanes.

The basic procedure for the field study began with establishing a theoretical basis, conducting site analysis, preliminary studies and photographing the area. Field research allowed observers to deepen and broaden their knowledge of the subject being analyzed, to directly experience the circumstances of the study, leading to new concepts about a given reality (BANKS, 2009).

3.1 OPERATIONAL PROCEDURES FOR THE LANDSCAPING INTERVENTION

The landscaping intervention was carried out by implementing a landscaping project composed of herbaceous and shrub species with decorative characteristics through plant associations of elecampane, forage peanut, boxwood and mini-azalea, thus forming hedges (living fence) and massifs of varying volumes and colors.

3.1.1 THE ELEVENTH HOUR (PORTULACA GRANDIFLORA)

- Prepare the soil for planting.
- Dig holes 15-20 centimeters apart.
- Water after planting and then when the soil is dry to a depth of 2-3 centimeters. They are more tolerant of drought than excessive moisture.

- Apply balanced slow-release fertilizer in spring to promote healthy growth and abundant flowers.
- Space 25 to 45 seedlings per square meter to form the core.

3.1.2 FODDER PEANUT (ARACHIS PINTOI)

- Prepare the soil for planting.
- Dig holes 10 centimeters apart. Each hole should receive two seedlings, placed with the base of the propagule downwards, so that 2/3 of the seedling is inside the hole.
- Water after planting and then when the soil is dry to a depth of 2-3 centimeters. They are more tolerant of drought than excessive moisture.
- Apply a balanced slow-release fertilizer in spring to promote healthy growth and abundant flowers.
- It should be pruned to 3-5 cm above the ground.

3.1.3 BOXWOOD (BUXUS SEMPERVIRENS)

- Dig a hole a little wider and deeper than the plant's root ball. Place the seedling in the hole, making sure that the surface of the root ball is level with the surrounding soil.
- Plant individually in rows, with 1 meter spacing between them.
- Water regularly, especially during the first few months after planting, keeping the soil moist but not soggy. Avoid overwatering, as this can lead to root rot.
- Pruning is recommended once or twice a year, between May and August. If you only trim once, do it in August. Pruning in May encourages density, but this new growth can be vulnerable to the weather conditions.

3.1.4 MINI-AZALEA (RHODODREDRON SIMSII)

- Prepare the soil for planting.
- The hole should contain a space twice the size of the seedling's root ball and line the bottom with 5 to 7 cm of sand so that the roots are protected.
- Water regularly in the late afternoon. It does not tolerate prolonged drying out or excessive waterlogging.
- Pruning is necessary to promote new shoots and renew the foliage after flowering. This pruning should be done according to the shape of the plant and the desired height of up to 50 cm.

3.1.5 WEEPING TREE (SCHINUS MOLLE)

- Pruning of the *Chorão* tree, considered native to the region. This tree will be preserved on-site, with only formative pruning recommended to prevent its branches from interfering with the electricity network.

Revista Latino-americana de Ambiente Construído & Sustentabilidade
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3.2 3.2 PROJECT

The landscaping project was developed by drawing up the ground plan in *Autocad* software, as well as the 3D execution using *Archicad* software, and the vegetation was modeling using RPC (Rich Photorealistic Content) images with *ArchVision* software, to improve the visualization and understanding of the project in practice.

4 RESULTS

The study was conducted along the right side of the BR 376 dual carriageway, which runs through the urban area of Maringá, between km 180+263 and km 180+416. The UTM geographic coordinates are as follows: initial point at 408750.00 m E and 7408742.00 m S; and final: 408882.66 m E and 7408663.70 m S. This area consists of neglected empty spaces (see Figure 02).

Figure 2 - Spaces without proper care and trees with compromised plant health.

Photo: Ricardo Ramos Regio

The empty space in the urban area is significant for users, and the implementation of the landscaping project (see Figure 3) in the right-of-way aims to restore the environment while enhancing aesthetic appeal and road safety. This integration will reconnect the road the landscape, leading to the reconstruction of the green spaces within the right-of-way and their reintegration into nature.

According to Santos (1996, p. 26), "[...] Space must be considered as an inseparable whole in which a certain arrangement of geographical objects, natural objects and social objects participate on the one hand and, on the other, the life that fills them and animates them, in other words, society in movement".

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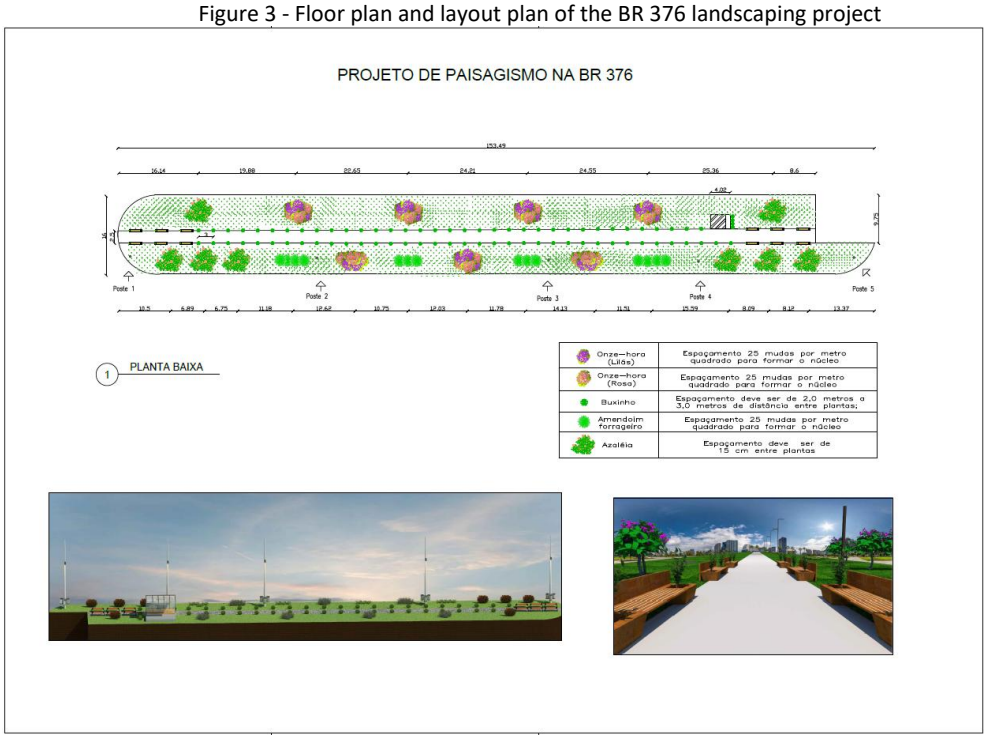
It is clear that urban space and society are inseparable, as social relations manifest within a territory. Consequently, in the process of living, society produces and reproduces space as a practice (CARLOS, 2004).

Within urban areas, domain strips are designated as public utility zones, intended for the construction and operation of the motorway. These areas encompass access points, complementary service stations, carriageways, shoulders, central medians, side safety lanes, cut slopes, embankments and drainage elements, escape areas, and vertical signage. The width of the domain strips varies for each motorway, with regulations governing their occupation established by Decree 140/2015 (DER-PR/2024). From this perspective, landscaping in domain strips plays a crucial aesthetic, social, environmental, and safety role in enhancing the vitality of the motorway.

Socio-environmental responsibility inspires actions toward a new vision of the world, based on the three pillars of sustainability: environmental, social and economic. The goal is to promote responsible behavior through conscious consumption and the subsequent reduction of environmental impacts.

In line with socio-environmental initiatives addressing these pillars of sustainability, the landscaping intervention on the motorway's right-of-way considered aspects of re-urbanization and urbanization. The landscaping project (see Figure 3) incorporated medium-sized plants (ranging in height from 15 to 60 cm), selecting tropical species with excellent aesthetic qualities and durability. These plants are recommended for hedges (living fences) and colorful arrangements that break up the monotony of color and flora, resulting in a sub-shrub/shrub design that enhances the environment coziness, creating a green haven with the most suitable plants.

Figure 3 - Floor plan and layout plan of the BR 376 landscaping project



Source: Prepared by the authors, 2024.

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Lima (2016) also mentions that the use of compact hedges of shrub vegetation is recommended for the central medians of dual carriageways to reduce glare from oncoming vehicles headlights.

Based on this study, an integrated landscape analysis of the area's natural resources - such as soil, vegetation, climate, rainfall, urban environment and the region's socio-economic issues - led to the landscape intervention on the BR-376 carriageway between km 180+263 and km 180+416 (see Figures 4 and 5).

For this intervention, species were selected that are resilient to climatic diversity, including perennial, herbaceous, and flowering shrubs, combined with legumes and grasses that help mitigate surface erosion processes (e.g., gullies, soil dissection) by forming humus and providing rapid soil coverage.

Figure 4 - Implementing the landscape project

Photo: Ricardo Ramos Regio

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Figure 5 - Integration of the road system with the urban system.

Photo: Ricardo Ramos Regio

Taking these characteristics into account, the following species were selected:

- ***Fodder peanut:*** a perennial herbaceous legume with high nutritional value. It grows at a creeping rate, producing a dense layer of stolons, which protects its growing points from grazing;
- ***Boxwood:*** a low, branched, woody shrub with a bright green color, commonly used for hedges. It is both decorative and durable, requiring minimal maintenance.
- ***Eleven o'clock:*** a decorative plant available in red, orange, yellow, white, pink or violet. It requires little care and adapts well to various climatic conditions, including cold periods with frost;
- ***Mini azalea:*** a woody, evergreen shrub with decorative appeal. It blooms from autumn to winter with single or double flowers, forming compact tufts of elongated dark green leaves.

The selected species were planted in the specified locations as indicated in the landscaping project. The planting and distribution of seedlings followed the project's specifications and were executed by specialized professionals. This process involved soil preparation, planting, fertilization, watering, maintenance, pruning, and phytosanitary control of the seedlings.

Additionally, during the implementation of the project, it was necessary to remove five (5) trees of non-native species from the area designated for the landscaping project, as their health had been compromised. A native weeping tree (Schinus molle) located in the flowerbed was preserved, and will only require pruning to prevent interference with the electricity transmission line that crosses the area.

This project was carried out by the company IPR - Property manager, which requested permission from DER/PR to occupy the motorway's right-of-way in order to implement the landscaping project along this section. The company also requested responsibility for maintaining and preserving the landscaped area, as it owns a petrol station located along this stretch of the motorway. In addition to addressing the site's urban issues, the project enhances the area's aesthetics and promotes urban humanization in front of the business.

In this section of the BR-376, the bike lane was restored, enabling the use of bicycles once again. Additionally, appropriate horizontal and vertical signage was installed to improve access to the side road and help prevent accidents, there.

This study highlights the importance of landscaping in motorway right-of-ways that cross urban areas, demonstrating various benefits achieved such as the revitalization of the space, the integration of the motorway's right-of-way into the urban environment, and the reconstruction of green areas. These efforts contribute to the ecosystem and benefit the city as a whole.

5 CONCLUSION

The implementation of landscaping projects in highway right-of-ways that cross urban areas will contribute to both aesthetic enhancement and local sustainability. These projects address the social, economic and environmental dimensions, promoting environmental restoration, improving road safety, and enhancing the quality of life for the local community. They also integrate the road system with urban areas through the creation of green spaces.

In this regard, according to Macedo (1999), road landscaping, in addition to fulfilling the key objectives of landscape architecture, plays a vital role in saving lives by using vegetation as a safety feature. Vegetation helps guide traffic and provides greater comfort, safety, and well-being for road users.

Another significant finding of this study is the positive outcomes that can be achieved through partnerships between the public sector (DER/PR), the private sector (IPR – Property Manager), and educational institutions. These collaborations can generate substantial benefits for society, particularly for the local community, when they work together for a common goal - in this case, the landscaping of a neglected state area to improve its aesthetic condition. This joint effort not only address urban issues and enhances the site's appearance but also promotes urban development, humanization, and road safety for both the enterprise and road users.

Lastly, this study highlights the importance of landscaping along roadways that pass through urban areas, where neglected spaces often contribute to urban issues, safety concerns, and inadequate signage for users. The study also outlined various benefits, including the revitalization of these spaces, the integration of the motorway's domain strip into the

urban environment, and the reconstruction of green areas. These efforts not only enhance the ecosystem bur also provide mutual benefits for both society and nature.

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