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Diagnosis and proposal for revitalizing the urban image of the Parroquia Park in Veracruz, Pastaza

*Diagnóstico y propuesta de revitalización de imagen urbana del Parque de la Parroquia
Veracruz, Pastaza*

*Diagnóstico e proposta de revitalização da imagem urbana do Parque de la Parroquia
Veracruz, Pastazaza*

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ABSTRACT

The present study aims to propose the redesign of the Veracruz Park in Puyo, Pastaza, through a comprehensive diagnosis of the current state of the park and the implementation of grey, green and blue infrastructures to improve its scenic image and functionality. Using an experimental and descriptive research methodology, the plant components of the tree, shrub and herbaceous strata, as well as the physical infrastructure of the park, were evaluated. The Sketchup Pro program was used to visualize the proposed redesign. The diagnosis identified deficiencies in the drainage systems and water quality, in response to which the park was redesigned. Four herbaceous species were introduced (*Turnera ulmifolia* L., *Ruellia tuberosa* L., *Phaius tankervilleae* (Banks ex L'Hér.) Blume, *Duranta repens* L.) to improve aesthetics and reinforce cultural identity. The shrub layer was enriched with *Megaskepasma erythrochlamy* Lindau, *Bougainvillea spectabilis* Willd., *Mussaenda erythrophylla* S., *Allamanda cathartica* L. The tree species *Terminalia catappa* L., *Bismarckia nobilis* H. and *Archontophoenix myolensis* Dowe, were selected to enhance the landscape, provide shade. Blue infrastructure, including sustainable drainage systems and water retention areas, was implemented to efficiently manage rainwater, reducing flood risks and improving the environmental quality of the park. Together, these interventions promote a more attractive, sustainable and ecologically diverse urban environment, elevating the quality of life of residents.

Keywords: biodiversity, blue infrastructure, green infrastructure, urban parks, sustainable redesign.

RESUMEN

El presente estudio tuvo como objetivo proponer el rediseño del Parque Veracruz en Puyo, Pastaza, mediante un diagnóstico exhaustivo del estado actual del parque y la implementación de infraestructuras gris, verde y azul para mejorar su imagen escénica y funcionalidad. Utilizando una metodología de investigación experimental y descriptiva, se evaluaron los componentes vegetales de los estratos arbóreo, arbustivo y herbáceo, así como la infraestructura física del parque. El programa Sketchup Pro fue empleado para visualizar



el rediseño propuesto. El diagnóstico identificó deficiencias en los sistemas de drenaje y la calidad del agua, en respuesta a esto se rediseñó el parque. Se introdujeron cuatro especies herbáceas (*Turnera ulmifolia* L., *Ruellia tuberosa* L., *Phaius tankervilleae* (Banks ex L'Hér.) Blume, *Duranta repens* L.) para mejorar la estética y reforzar la identidad cultural. El estrato arbustivo se enriqueció con *Megaskepasma erythrochlamy* Lindau, *Bougainvillea spectabilis* Willd., *Mussaenda erythrophylla* S., *Allamanda cathartica* L. Las especies arbóreas *Terminalia catappa* L., *Bismarckia nobilis* H. y *Archontophoenix myolensis* Dowe, se seleccionaron para mejorar el paisaje, proporcionar sombra. La infraestructura azul, que incluye sistemas de drenaje sostenible y áreas de retención de agua, fue implementada para gestionar eficientemente el agua de lluvia, reduciendo riesgos de inundaciones y mejorando la calidad ambiental del parque. En conjunto, estas intervenciones promueven un entorno urbano más atractivo, sostenible y ecológicamente diverso, elevando la calidad de vida de los residentes

Palabras clave: biodiversidad, infraestructura azul, infraestructura verde, Parques urbanos, rediseño sostenible.

RESUMO

O objetivo deste estudo é propor o redesenho do Parque Veracruz em Puyo, Pastaza, através de um diagnóstico exaustivo do estado atual do parque e da implementação de infraestruturas cinza, verde e azul para melhorar sua imagem cênica e funcionalidade. Utilizando uma metodologia de pesquisa experimental e descritiva, foram avaliados os componentes vegetais dos estratos arbóreos, arbustivo e herbáceo, bem como a infraestrutura física do parque. O programa Sketchup Pro foi utilizado para visualizar o redesenho proposto. O diagnóstico identificou deficiências nos sistemas de drenagem e na qualidade da água, em resposta a isso o parque foi redesenhado. Quatro espécies herbáceas (*Turnera ulmifolia* L., *Ruellia tuberosa* L., *Phaius tankervilleae* (Banks ex L'Hér.) Blume, *Duranta repens* L.) foram introduzidas para melhorar a estética e reforçar a identidade cultural. O estrato arbustivo foi enriquecido com *Megaskepasma erythrochlamy* Lindau, *Bougainvillea spectabilis* Willd., *Mussaenda erythrophylla* S., *Allamanda cathartica* L. As espécies arbóreas *Terminalia catappa* L., *Bismarckia nobilis* H. e *Archontophoenix myolensis* Dowe, foram



seleccionadas para mejorar a paisagem, proporcionar sombra. A infraestrutura azul, que inclui sistemas de drenagem sustentáveis e áreas de retenção de água, foi implementada para gerir eficientemente as águas pluviais, reduzindo os riscos de inundações e melhorando a qualidade ambiental do parque. Juntas, estas intervenções promovem um ambiente urbano mais atrativo, sustentável e ecologicamente diversificado, elevando a qualidade de vida dos residentes.

Palavras-chave: biodiversidade, infraestrutura azul, infraestrutura verde, parques urbanos, redesenho sustentável

INTRODUCTION

The landscape in Ecuador has been preserved by studying the attributes of urban landscapes, aimed at making decisions about public space in each city to increase visual quality. Thus, the landscape is defined as any part of the territory perceived by the population, whose representation is the result of the action and interaction of natural and/or human factors (González-Biffis 2020).

The landscape in urban areas is deeply intertwined with the process of territorial formation of the city, promoting its transformation towards a more environmentally conscious environment (Benassi 2015). This integration allows us to explore the possibility of better coexistence, highlighting the influence of human action on its habitat, as well as the disagreements and transformations that arise from it. Considering the area and management of the landscape facilitates working with vegetation at different scales and in different types of projects, supporting the conservation and restoration of the ecosystem.

Public spaces, such as urban parks represent an integral part of culture and their importance lies in their contribution to community life, where activities take place. These parks are green spaces that generally include vegetation, trails, rest areas, sports facilities and representative monuments, among others. These elements allow citizens to be in contact with nature, enjoy recreational activities and appreciate the culture of the area (Cabieses 2017).



Urban parks serve multiple essential functions within the urban environment. They not only act as recreational elements and part of urban amenities, but are also factors of ecological balance and significant aesthetic components. The importance of these parks in the city lies in their ability to facilitate positive social interaction between people of different ages and cultures. According to Kabisch *et al.* (2017), urban parks promote social cohesion and cultural integration, offering a common space where experiences can be shared and relationships built.

The vegetation present in these spaces contributes significantly to reducing the stress of urban inhabitants, providing a feeling of tranquility and well-being (Wendelboe-Nelson *et al.* 2019) . In addition, recent studies have shown that exposure to urban green areas is associated with a decrease in stress levels and an improvement in mental health.

A sense of belonging is crucial for the conservation and active use of urban parks. According to a study by Peters *et al.* (2010), urban green spaces that are well integrated into the daily lives of residents promote greater community engagement and care. This is because parks that are perceived as part of the personal and everyday environment of inhabitants generate a stronger emotional connection, leading to a greater sense of responsibility and care towards these spaces.

Furthermore, Hunter *et al.* (2019) suggest that the perception of parks as safe and accessible spaces increases their use and appreciation by residents. Lack of investment in infrastructure and maintenance can decrease the perception of safety and accessibility, contributing to the neglect and abandonment of these spaces. Currently, Veracruz Park is in a state of total abandonment, evident in the deterioration of its infrastructure, inadequate preservation of vegetation, and lack of general maintenance. Essential tasks such as the control of invasive species, the removal of garbage in fountains and throughout the park, and the irrigation and pruning of plant species have not been carried out, which contributes to a neglected appearance of the area. The present work aims to propose the redesign of Veracruz Park in Puyo, Pastaza, through a comprehensive diagnosis of its current state, in order to improve its scenic image and functionality.



MATERIALS AND METHODS

The work was carried out in the Veracruz Parish, located in the Ecuadorian Amazonian Central region, 7 km southeast of the capital Puyo, belonging to the Pastaza Province and Canton. With an area of 181.3 km², it occupies the central area of the canton, at an altitude of 600 m above sea level. Its boundaries include the 10 de Agosto parish to the north, the Pomona and Simón Bolívar parishes to the south, the El Triunfo and Canelos parishes to the east, and the Puyo and Tarqui parishes to the west (Gobierno Autónomo Descentralizado Parroquial de Veracruz 2019).

According to official projections from the National Institute of Statistics and Census, the population of the Veracruz Parish in 2020 was 2,392 inhabitants. 47.16% of the population resides in the parish capital, while 34.22% lives in legally recognized communities, and the remaining 18.62% is in non-legalized settlements. In addition, the annual population growth rate is estimated to be 3.18% (National Institute of Statistics and Census INEC 2020).

The diagnosis of Veracruz Park was carried out through a visual analysis, which facilitated the identification of various problems present in the area. This process included exhaustive tours of the park. This approach facilitated the identification and understanding of indicators that were visible to the naked eye (Casillas Zapata *et al.* 2018).

In the diagnosis of the structural particularities of the park, the characterization according to the already established design was considered, addressing the following points:

The shape of the park in relation to its architecture and total area (Escobar 2010). The different configurations of the park's internal arrangements were analyzed, including:

The elements present, their quantity, shape and real photographs of the park, in addition to the real situation of the plant species according to the following aspects.

1. Distribution and identification of plant species according to the tree, shrub and herbaceous strata.
2. Morphological state of plants, including development of the stem, branches and presence of undesirable plants.



3. Presence of garbage and other objects that negatively affect the image of the study area.
4. Soil or substrate conditions according to the architectural structure of the Park.

For the grey infrastructure, a visual inspection was carried out to check the physical and functional condition of each element, as well as the materials used and their resistance to climatic conditions and frequent use (Alves *et al.* 2019). In addition, maintenance records were reviewed to identify recurring patterns and needs.

For the evaluation of the water component, the status and functionality of each component was inspected and documented (Xu *et al.* 2019). The capacity of the drainage and water retention systems to handle heavy rainfall, the efficiency of natural filtration, and the ability of the drainage and water retention systems to handle heavy rainfall were measured.

For the redesign of Veracruz Park, software tools were used for the creation and editing of 2D geometries and 3D models. SketchUp Pro was used for volumetric, while AutoCAD was used for design, allowing for an accurate representation of surfaces and objects in the park (Gamal *et al.* 2024). Additionally, aerial photos obtained by a DJI drone were used to document the *in-situ* arrangements and issues of the park, as well as the distribution of its structural spaces.

AutoCAD facilitated the professional creation and editing of 2D geometry and 3D models, including solids, surfaces, and objects, and enabled the real-world measurements of park spaces such as pathways, furniture, structures, landscaping, and overall park functionality to be captured (Gamal *et al.* 2024). Lumion Pro in 3D provided a realistic visualization of the park redesign, showing the planned arrangements.



RESULTS AND DISCUSSION

Veracruz Park covers a total area of 3,799 m², with dimensions of 70.1 m wide and 54.2 m long. It has been noted that the park has an irregular geometric configuration, a characteristic that is also reflected in the shapes of its internal structures. The park includes a semicircular agora, square spaces with irregular edges for gardening, and children's play areas and bio-healthy areas. However, the bio-healthy areas are inoperative due to their deterioration. In addition, the walkways are irregular and non-functional, with displaced and accumulated paving stones in several sections (Figure 1).



Figure 1. - Structural elements that make up the architecture of Veracruz Park

The main deficiencies of the water system include inadequate or poorly designed drainage systems that cannot handle heavy rainfall, causing flooding, soil erosion and damage to park infrastructure. In addition, stagnant water favors the accumulation of solid waste, algae growth, bad odors and health risks for visitors and local wildlife. The lack of regular or routine maintenance of water systems causes clogged drains and inoperative fountains and results in: deterioration of the functionality and aesthetics of water features, as well as an increase in long-term repair costs coinciding with Sharma *et al.* (2016).



The park has been designed to include plant arrangements in different strata (shrubs, trees and herbs). However, the presence of garbage, construction materials, unwanted plants and deteriorated infrastructure contribute to a negative appearance for visitors. These problems, which coincide with studies on the importance of proper design and maintenance of urban parks (Jim and Chen 2009) , also highlight that the irregularity in the structure and the lack of maintenance can negatively affect their use and aesthetic perception of these spaces.

In another context Peschardt *et al.* (2016) found that the quality of urban furniture, including playgrounds and walkways, is crucial to promote the active use of parks and for the mental and physical health of users. The lack of functionality in children's playgrounds and bio-healthy playgrounds in Veracruz Park underlines the need for interventions to improve these facilities and thus maximize their use and benefits.

During the tour of Veracruz Park according to diagnosis, six plant species were identified and their morphological conditions were evaluated to determine if they should be maintained or replaced by more suitable ones. Two types of palms were identified *Bismarckia nobilis* Hildebrandt & H. Wendl. and *Archontophoenix myolensis* Dowe, a *Terminalia catappa* L., an ornamental shrub species *Megaskepasma erythrochlamys* Lindau and the *Arachis pintoii* Krapov. & WCGreg. present in various areas of the park, in addition to *Eleusine indica* (L) Gaertn. considered as an unwanted plant (Figure 2).

There is also a notable predominance of exotic species, a phenomenon largely due to their adaptability and superior aesthetic characteristics. These species are selected for their ability to thrive in adverse urban conditions, such as pollution and water stress, making them more viable for use in landscaping (Johnson and Munshi-South 2017).





Bismarckia nobilis Hildebrandt & H. Wendl



Archontophoenix myolensis,
Dowe



Terminalia catappa, L.



*Megaskepasma
erythrochlamys*, Lindau



Arachis pintoii Krapov. & W.C.
Greg.



Eleusine indica, (L).
Gaertn

Figure 2.- Vegetation of the study area according to the tree, shrub and herbaceous stratum

During a tour of the park, it was observed that the herbaceous stratum has invaded areas without adequate soil management. Neglect has allowed unwanted plants to expand, covering paths and trails. In addition, the paving stones, displaced and piled up due to lack of maintenance, affect both accessibility and the aesthetic experience of visitors. These problems coincide with those raised by Blanco Gómez *et al.* (2023) highlight that public spaces, such as urban parks, squares and gardens, require adequate maintenance in terms of conservation and consolidation. This is essential to preserve both their function and appearance as well as the historical heritage that represents local cultures and traditions.

Proper soil management is essential to maintain biodiversity in urban areas. Poor soil management directly affects the composition and structure of vegetation, allowing the expansion of herbaceous species in the absence of human intervention (Pantaloni *et al.* (2022).

However, another aspect to take into account when managing green areas is the proliferation of unwanted plant species, which compete with native species and can significantly alter urban ecosystems (Norton *et al.* 2016).



Redesign of the Park in terms of the selection of species according to strata

To revitalize the park, it is proposed to incorporate diverse and attractive vegetation, combining exotic and native species. These plants will not only provide shade and scenic beauty, but will also enrich the space with their bright flowers and act as natural decontaminants in different strata.

According to Zha *et al.* (2024), vegetation, including urban blue spaces, has been identified as an effective strategy to mitigate urban heat and increase biodiversity with its beauty. These measures improve the thermal resilience of cities through nature-based climate adaptation, thereby reducing heat-associated health risks and promoting visitor interaction and well-being.

Planning vegetation in urban parks should consider functionality as well as the aesthetic appeal of the selected species. It is essential to include plants that provide shade to create comfortable and cool resting areas. For example, plants with colorful and fragrant flowers can attract visitors and enrich their sensory experience in the park (Fang *et al.* 2023).

Table 1 presents exotic and native species recommended for the revitalization of the Veracruz Urban Park, organized by plant strata: four herbaceous, four shrubby, and three tree species, also including established species that will be maintained in the park. The selection of these species was based on criteria of adaptation, sustainability, and social and ecological benefits. The chosen plants contribute to urban biodiversity, providing habitats for pollinators and other beneficial organisms, and enhance the aesthetic value and well-being of residents. In addition, they are able to withstand urban climatic conditions, such as high temperatures and extreme humidity variations (Thompson *et al.* 2016).



Table 1.- Vegetative species according to the type of stratum and their classification for the Veracruz Park

Stratum	Scientific name	Classification
Herbaceous	<i>Turnera ulmifolia</i> L.	Exotic
	<i>Ruellia tuberosa</i> L.	Exotic
	<i>Phaius tankervilleae</i> (Banks ex L'Hér.) Blume	Native
	<i>During rethinking</i> L .	Exotic
Shrubby	<i>Megaskepasma erythrochlamy</i> Lindau	Exotic
	<i>Bougainvillea spectabilis</i> Willd	Exotic
	<i>Mussaenda erythrophylla</i> S.	Exotic
	<i>Allamanda cathartica</i> L.	Native
Arboreal	<i>Terminalia catappa</i> L.	Exotic
	<i>Bismarckia nobilis</i> H.	Exotic
	<i>Archontophoenix myolensis</i> Dowe	Exotic

It is essential that these species require low maintenance in terms of irrigation, pruning and pest control, and they must also be tolerant of air and soil pollution. This aspect is crucial for the management of urban green areas (Nadgórska–Socha *et al.* 2017).

Figure 3 illustrates the significant deterioration of the area, evidenced by the wear and tear of roads and paths, as well as the displacement of paving stones, which compromises accessibility. In addition, deterioration of street furniture is observed, including benches, lampposts and rest areas, which reduces their functionality and safety. Regarding green infrastructure, a loss of vegetation is recorded due to lack of maintenance, together with the invasion of invasive species that displace local flora, thus affecting biodiversity.

The proposal for the redesign of Veracruz Park therefore focuses on harmoniously integrating grey, green and blue infrastructures. Each component plays a crucial role in the revitalization of the space, complementing each other rather than competing (Dorst *et al.* 2019).





Figure 3.- Aerial image of Parque Veracruz in the diagnosis

The grey infrastructure of Veracruz Park was designed with a focus on durability and aesthetics, ensuring that the built elements are visually appealing and able to withstand the test of time. This includes paths, benches, playgrounds and other urban amenities that beautify the park and offer functionality and resilience. Accessibility and comfort are priorities in this design, so that all people, regardless of their physical abilities, can fully enjoy the facilities. This inclusive and functional approach aligns with the recommendations of Zamani and Babaei (2021), who highlight that urban planning and design should be based on a proper understanding of nature and the recognition of its various facets and limitations. By using a grounded theory method (GTM) in qualitative urban planning and design, welcoming spaces can be created for all.

The green infrastructure of the Park includes gardens, trees and lawn areas. The careful selection and distribution of plant species is crucial to the sustainability and functionality of the park, as well as providing ecosystem benefits. The inclusion of native species in the design of urban parks promotes biodiversity and ensures the sustainability of the park ecosystem (Ibes 2016), including mitigating the urban heat island effect, improving air quality and creating habitats for local fauna. In addition, this herbaceous-shrub environment facilitates interaction between people, revitalizing the park and creating a healthy ecological environment.



The blue infrastructure of the Veracruz Park redesign focuses on the efficient management of rainwater due to the high annual rainfall in the area through ponds, fountains and sustainable drainage systems. According to Fletcher *et al.* (2015), these systems reduce flood risk, improve water quality and complement green and grey infrastructure, creating a cohesive and resilient urban space.

Figure 4 provides a detailed visualization of the redesign of Veracruz Park, allowing its current state to be compared with the proposed rehabilitation, through the use of new species to encourage biodiversity, garden spaces that allow for stormwater infiltration, improving water quality and reducing runoff. The images highlight changes in containers, and the combination of herbaceous plants, shrubs and trees. According to Zingraff-Hamed *et al.* (2022), detailed visualization of urban design proposals is crucial to effectively communicate planned improvements and gain community buy-in. The integration of new plant species not only improves the aesthetics of the park, but also contributes to biodiversity and ecological sustainability.



Figure 4.- Proposal for the Redesign of Veracruz Park, (I) Herbaceous stratum species: a) Red Duranta, b) Orchid, c) Green Duranta, d) Turnera, e) Ruellia. (II) Revitalized container with almond trees. (III) Revitalized area with a silver palm and orchids in the center surrounded by Duranta.

Figure 5 provides an aerial and panoramic view of the redesign of Veracruz Park, showing the arrangement of the grey, green and blue infrastructures. This perspective facilitates the understanding of the visual and functional impact of the new design, highlighting the



integration of the different elements to create a cohesive and sustainable environment. The combination of these infrastructures is essential to design resilient urban spaces. According to Pamukcu-Albers *et al.* (2023) this integration significantly improves the quality of the urban environment, promoting both the functionality and aesthetics of the space.



Figure 5. - Panoramic view of Veracruz Park according to redesign

Integrated planning of these infrastructures is essential to address contemporary environmental and urban challenges. According to Liu *et al.* (2020), Green infrastructure is one of the most cost-effective ways to mitigate and adapt to socio-ecological challenges, offering multifunctional ecosystem services. This has generated significant changes in the composition, design and connectivity of cities, improving social and ecological resilience both in the study area and in other similar megacities.



CONCLUSIONS

The diagnosis of Veracruz Park identified six plant species, of which it was proposed to replace *Arachis pintoi* and *Eleusine indica* in the park rehabilitation process.

The new grey infrastructure, which includes pathways, benches and play areas, has been designed to be aesthetically pleasing, accessible and resilient, significantly improving the visitor experience.

The integration of grey, green and blue infrastructure has resulted in a more functional and resilient park contributing to improving the quality of life of its inhabitants.

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The authors declare not to have any interest conflicts.

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The authors have participated in the writing of the work and analysis of the documents.





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