

Mapping stakeholders for brownfield revitalization with Nature-Based Solutions

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Mapeamento de atores para revitalização de *brownfield* com Soluções Baseadas na Natureza

RESUMO

Objetivo - Compreender quais seriam os stakeholders em um projeto com Soluções Baseadas na Natureza (SbN) de revitalização na brownfield Brasital, em São Roque-SP.

Metodologia – Para caracterizar os stakeholders utilizou-se como metodologia uma adaptação para o cenário de São Roque - SP e da Brasital de um estudo sobre a abrangência de *brownfields* na Inglaterra para definição de políticas públicas nacionais.

Originalidade/relevância - A revitalização da Brasital oferece uma oportunidade única de integrar práticas sustentáveis no planejamento urbano. O sucesso do projeto depende de soluções que equilibram os interesses dos diversos stakeholders, cujas expectativas podem divergir. A definição clara desses agentes é essencial, pois os serviços ecossistêmicos fornecidos podem não atender igualmente a todos os interesses.

Resultados - O resultado mostra uma gama de stakeholders envolvendo poder público, órgãos regulatórios, sociedade civil, ONGs, indústrias e comércios locais, profissionais, entre outros.

Contribuições teóricas/metodológicas - Auxílio na realização de abordagem integrada em projetos, que combine SbN com soluções customizadas para atender às expectativas específicas dos envolvidos.

Contribuições sociais e ambientais – Fortalecimento do engajamento dos *stakeholders*, através da identificação dos grupos que representam a sociedade e o meio ambiente, para envolvimento planejamento das intervenções, o que contribui para maior alinhamento do projeto com as expectativas desses grupos e sucesso do projeto a longo prazo.

PALAVRAS-CHAVE: Soluções Baseadas na Natureza; Stakeholders; Brownfields.

Mapping stakeholders for brownfield revitalization with Nature-Based Solutions

ABSTRACT

Objective – The aim of this study is to identify the relevant stakeholders in a project involving Nature-Based Solutions (NbS) for the revitalization of the Brasital brownfield in São Roque-SP.

Methodology – To characterize the stakeholders, an adaptation of a study on the scope of brownfields in England was employed, tailored to the specific context of São Roque-SP and Brasital, with the purpose of informing national public policy formulation.

Originality/Relevance – The revitalization of Brasital represents a unique opportunity to integrate sustainable practices into urban planning. The success of the project hinges on finding solutions that balance the interests of diverse stakeholders, whose expectations may vary. A clear definition of these stakeholders is essential, as the ecosystem services provided may not adequately fulfill the interests of all involved parties.

Results – The findings reveal a diverse set of stakeholders, including public authorities, regulatory agencies, civil society, NGOs, local industries, businesses, professionals, among others.

Theoretical/Methodological Contributions – This study contributes to the adoption of an integrated approach in projects that combine NbS with tailored solutions to address the specific needs and expectations of stakeholders.

Social and Environmental Contributions – Enhancing stakeholder engagement through the identification of groups representing society and the environment, ensuring their involvement in the planning of interventions. This approach fosters greater project alignment with their expectations and supports long-term project success.

KEYWORDS: Nature-Based Solutions; Stakeholders; Brownfields.

Mapeo de actores para la revitalización de brownfields con Soluciones Basadas en la Naturaleza

RESUMEN

Objetivo - Comprender quiénes serían los actores clave en un proyecto con Soluciones Basadas en la Naturaleza (SbN) de revitalización en el brownfield Brasital, en São Roque-SP.

Metodología - Para caracterizar a los actores clave, se utilizó como metodología una adaptación al contexto de São Roque-SP y de Brasital de un estudio sobre la extensión de los brownfields en Inglaterra para la definición de políticas públicas nacionales.

Originalidad/Relevancia - La revitalización de Brasital ofrece una oportunidad única para integrar prácticas sostenibles en la planificación urbana. El éxito del proyecto depende de soluciones que equilibren los intereses de los diversos actores clave, cuyas expectativas pueden divergir. La definición clara de estos agentes es esencial, ya que los servicios ecosistémicos proporcionados pueden no satisfacer por igual todos los intereses.

Resultados - El resultado muestra una gama de actores clave, incluyendo el sector público, organismos reguladores, sociedad civil, ONGs, industrias y comercios locales, profesionales, entre otros.

Contribuciones teóricas/metodológicas - Apoyo en la implementación de un enfoque integrado en proyectos, que combine SbN con soluciones personalizadas para atender las expectativas específicas de los involucrados.

Contribuciones sociales y ambientales - Fortalecimiento del compromiso de los stakeholders mediante la identificación de los grupos que representan a la sociedad y al medio ambiente, garantizando su participación en la planificación de las intervenciones. Este enfoque contribuye a un mayor alineamiento del proyecto con sus expectativas y al éxito del proyecto a largo plazo.

PALABRAS CLAVE: Soluciones Basadas en la Naturaleza; Actores clave; Brownfields.

1 INTRODUCTION

In recent decades, accelerated urbanization and environmental crises have posed complex challenges to urban centers, demanding innovative and integrated responses (ICLEI, 2021). Among the most pressing issues are the expansion of degraded urban areas, the impacts of climate change, and the loss of biodiversity, all of which directly affect the quality of life and resilience of cities (Millennium Ecosystem Assessment, 2005).

In this context, Nature-Based Solutions (NbS) have emerged as promising approaches, offering sustainable and socially inclusive responses. NbS are strategies that leverage natural processes and elements to address urban and environmental problems, providing multiple benefits such as climate regulation, flood control, increased biodiversity, and improvements in human health and well-being (Albert et al., 2021; Anderson & Gough, 2020). They are also essential in addressing the challenges posed by unplanned urban expansion and the underuse of spaces that could play key roles in environmental and social regeneration (ICLEI, 2021).

Brownfields are defined as lands or facilities previously used for industrial or commercial purposes and currently abandoned or underutilized. These areas are emblematic examples of areas that can benefit from NbS (Mathey et al., 2015; Washbourne et al., 2020) and represent a significant challenge for cities, as they are often associated with environmental contamination and social stigma, while also offering substantial potential for revitalization and sustainable development (Bryson, 2004; Selequim et al., 2024).

Internationally, brownfield redevelopment projects have yielded remarkable results. In Hamburg - Germany, the HafenCity project transformed former port areas into a vibrant urban district, combining green spaces, modern infrastructure, and the preservation of historical heritage. In Chicago - United States, Millennium Park converted a previously degraded site into a public space that attracts millions of visitors annually, promoting economic development and environmental enhancement (ICLEI, 2021; Parron et al., 2019). These examples demonstrate that, when well-planned, interventions in brownfields can generate positive impacts across multiple dimensions.

In Brazil, however, brownfield redevelopment still faces significant challenges, such as lack of funding, regulatory barriers, and the need for coordination among various stakeholders (Selequim et al., 2024; Parron et al., 2019). In this scenario, Brasital, located in the municipality of São Roque (SP), stands out as an emblematic case. Founded in 1892 as one of the first cotton textile factories in Latin America, Brasital is a landmark in the history of Brazilian industrialization and holds great architectural heritage value (Gallardo & Kaam, 2023). After its operations ceased in the 1970s, the site remained underutilized, representing both an urban problem and an opportunity for sustainable revitalization.

The creation of urban spaces is highly relevant to the well-being of the population and the improvement of quality of life in cities, as highlighted by Lopes, Matos, and Mesquita (2024). In this context, Brasital's strategic location which is close to the urban center and an important forest remnant gives it great potential as a model for NbS-based redevelopment. Furthermore, preserving its historical and cultural memory is essential for strengthening local identity, creating synergies between economic, environmental, and social development (Mathey et al., 2015).

The redevelopment of this area can contribute to the creation of spaces for social

interaction, recreation, and education, while also providing ecosystem services such as urban microclimate regulation, stormwater retention, and increased biodiversity (Millennium Ecosystem Assessment, 2005). Kaam and Gallardo (2023) conducted a monetary valuation study at Brasital, analyzing the potential provision of five ecosystem services: climate regulation, runoff reduction, air filtration and ventilation, carbon sequestration, and recreation, which were made possible through the integration of NbS such as infiltration surfaces, water bodies, and vegetation.

A key element for the success of Brasital's revitalization is understanding the expectations and interests of the stakeholders involved. Santiago and Godoy (2024) emphasize the importance of considering stakeholder perceptions in urban planning and the governance of open and green spaces, in order to reflect user needs and avoid issues such as inefficient space use, poor distribution, limited access, and challenges in ongoing conservation and management.

These stakeholders include the municipal government, which seeks to boost tourism and economic development; NGOs and environmental groups, interested in ecological preservation; the local community, which demands spaces for leisure and integration; and the private sector, which sees investment opportunities (Freeman, 1984; Bryson, 2004).

The stakeholder theory, as discussed by Freeman (1984), highlights the importance of involving all relevant actors such as the municipal government, local community, NGOs, and economic sectors to ensure that the project meets a wide range of needs and expectations.

Challenges in the development and management of multifunctional urban spaces, such as Brasital, may arise if trade-offs in ecosystem service provision occur for different stakeholders. However, an ecosystem's ability to provide a specific service does not necessarily meet all services demanded by the community, especially due to differences in expressed demand among stakeholder groups (Maron et al., 2017).

Different groups may prefer to manage the site to enhance certain services, possibly to the detriment of others or may face biophysical limitations in ecosystem service provision; for example, tree vegetation or grassland may promote some services while reducing others (de Groot et al., 2010). Whether these trade-offs can be eliminated, and whether the barriers are human or biophysical, often remains uncertain (Torralba et al., 2018).

Therefore, mapping stakeholders to align these demands is essential to prevent conflicts and maximize the benefits generated by brownfield revitalization projects in terms of ecosystem service availability.

2 OBJECTIVE

This study aims to map the stakeholders involved in a revitalization project incorporating NbS in Brasital site, a brownfield located in the city of São Roque, São Paulo.

3 METHODOLOGY

Alker et al. (2000) in their analysis of the development of the National Land Use Database (NLUD) in England have conducted a mapping effort led by the UK government in 1998

to identify brownfield sites and define initial policies regarding these areas. The authors concluded that the mapping was limited to the perspective of local authorities and proposed the need for a broader vision. Alker et al. (2000) consider the rehabilitation of brownfield sites for a wide range of end uses, which would involve multiple stakeholders in the process, including various professional groups such as planners, surveyors, lawyers, and developers; other public agencies; environmental groups; and local communities, in addition to local authorities.

In this context, the identification of stakeholders was based on the methodology proposed by Alker et al. (2000), which provides a comprehensive framework for brownfield regeneration projects, as presented in Frame 1.

Frame 1 - Stakeholders involved in brownfield redevelopment

Development interests	Professional interests	Regulatory interests	Other interests
Land and property developers	Lawyers	Central government departments	Academics (Schools, Universities, Researchers)
Institutional investors and banks	Planners	Environment agencies	Community groups
Land Owners	Civil and environmental engineers	Local authorities	Environmental and conservations groups
Industrial and comercial enterprises	Surveyors	Health and Safety Executive	Data management organizations
Public development sector organizations	Insurers		Individuals
Utilities	Environmental consultants		

Source: Alker et al (2010).

Accordingly, stakeholder mapping was carried out by applying this method to the Brasital brownfield in São Roque, characterizing and defining each of the groups.

3.1 Brief Description of Brasital – São Roque (SP)

Located in São Roque, São Paulo, Brasital is a former industrial facility with significant architectural and historical heritage. It was inaugurated in 1892 as one of the first cotton textile factories in Latin America. Operating until 1970, the factory occupies a considerable area of approximately 198,000 square meters of land and around 10,000 square meters of built-up area—distributed across five buildings that reflect the rich history of industrialization in the region. The complex is undergoing the heritage listing process by the Council for the Defense of Historical, Archaeological, Artistic and Touristic Heritage (CONDEPHAAT) under process no. 59254/09, further reinforcing its historical and cultural importance to the state of São Paulo (Neves, 2019). Figure 1 shows part of the Brasital facilities.

Figure 1 – Aerial Picture of constructions inside Brasital complex



Source: Authors (November, 2024)

The Brasital complex represents an opportunity for stakeholders, offering potential ecological and socio-economic benefits for the city through a project that integrates Nature-Based Solutions (NbS). Strategically located in the urban center and near a large forest remnant (Figures 2 and 3), Brasital is seen as a space with sustainable potential, preserving its historical value while promoting ecosystem services that contribute to the population's quality of life and well-being.

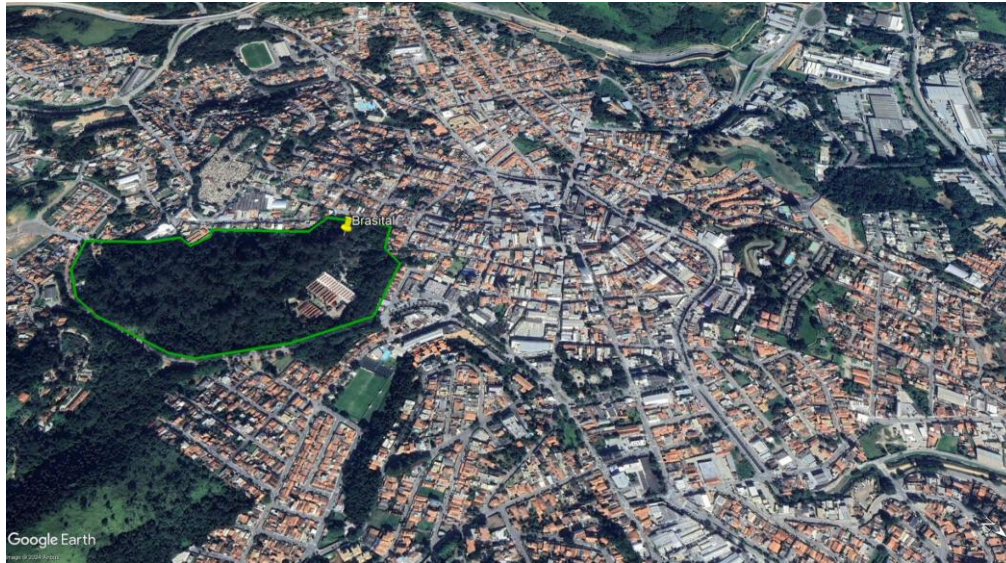
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Figure 2 –Brasital by left side represented on vegetated area



Source: Authors (October, 2024).

Figure 3 – Location of Brasital in the central area of the city of São Roque



Source: Image extracted from Google Earth Pro (October, 2024)

The preservation and revitalization of Brasital involves a diverse range of stakeholders, including the local government, civil society, the private sector, and environmental NGOs, each with specific expectations regarding the use and management of space. For the municipal government, Brasital is an asset that can boost tourism and local culture, promoting the city's sustainable economic development. Civil society, including local residents, values Brasital both as a space of collective memory and as a potential hub for leisure and cultural activities, reinforcing its role as a space for community integration.

4 RESULTS

Based on the framework proposed by Alker et al. (2010), applied to the Brasital area in the municipality of São Roque, stakeholders were identified and categorized according to their areas of interest, with the results presented in Frames 2, 3, 4, and 5.

Frame 2 refers to interest in development. Since the area is publicly owned, actors such as real estate developers and construction companies and service providers depend on municipal bidding processes to become involved; therefore, these categories were not included. For the banking sector, institutions that offer credit lines for municipalities to develop projects were identified, as noted by Verdélio (2023) and Martini (2024). Regarding industries and businesses, given their large number, the most representative associations and unions were considered. As for public development organizations, the Department for the Support of Development of Resort Towns (DADE) represents the State Government and provides strategic funding for municipalities with tourism potential, such as São Roque.

Frame 2 - Stakeholders involved in development interests

Development interests	
Stakeholder group	Stakeholders
Land and property developers	Companies to be contracted through public bidding
Institutional investors and banks	BID, BNDES, Caixa Econômica Federal, Banco do Brasil
Land Owners	Tourist Municipality of São Roque
Industrial and comercial enterprises	Sindusvinho, São Roque Commercial Association, Industrial Association of São Roque (AISAM), Retail Trade Union of São Roque, Hotels, Restaurants, Bars and Similar Establishments Union of São Paulo
Public sector development organizations	Department for the Development of Tourist Municipaly (DADE)
Utilities	Companies to be contracted through public bidding

Source: Authors

In the section on professional interest, Alker et al. (2010) identified specific classes of professionals associated with brownfield rehabilitation. Accordingly, to represent the group of municipal professionals, the professional councils of each category and relevant representative associations were identified and are summarized in Frame 3.

Frame 3 - Stakeholders involved in professional interests

Professional interests	
Stakeholder group	Stakeholders
Lawyers	OAB - São Roque (São Roque Lawyer's association)
Planners and civil and environmental engineers	ASSEA - Association of Engineers and Architects of São Roque and Region, CREA São Roque (Regional Council of Engineering and Agronomy), CAU São Roque (Council of Architecture and Urbanism)
Insurers	Sindsegsp (Union of Insurance, Pension, and Capitalization Companies of the State of São Paulo)

Source: Authors

Regarding regulatory interest, presented in Frame 4, the relevant municipal government departments were identified through the São Roque City Hall website. These departments and divisions are expected to be impacted by the project in terms of regulation, approval, and monitoring, considering both project development and construction execution (São Roque Tourist Municipality City Hall, 2024). The environmental agencies linked to SISNAMA include the state environmental agency CETESB and the São Roque Municipal Council for Environmental Protection (COMDEMA). Although not considered by Alker et al. (2010), the Brasital brownfield is a listed cultural heritage site and is therefore subject to specific regulations aimed at ensuring its preservation, and this category has been included accordingly.

Frame 4 - Stakeholders involved in regulatory interests

Regulatory interests	
Stakeholders group	Stakeholders

Central government departments	Division of Industry, Commerce and Services of the São Roque City Hall; Department of Tourism, Economic Development, Sports and Leisure; Division of Culture; Department of Public Works; Department of Education; Department of Social Welfare; Department of Finances; Department of Planning and Environment;
Environmental agencies	Municipal Council for Environmental Protection (COMDEMA), Environmental Company of the State of São Paulo (CETESB)
Cultural heritage preservation agencies	Council for the Defense of Historical, Archaeological, Artistic and Touristic Heritage (CONDEPHAAT)
Local authorities	Mayor, Deputy Mayor, City Councilors, Municipal Secretaries, City Council
Health and safety executive	Health Surveillance

Source: Authors

The mapping corresponding to the 'Other Interests' category is presented in Frame 5. Regarding academic stakeholders, all universities with a physical campus located within the municipality of São Roque were included. Considering the large number of schools in the municipality, those in closest proximity to the Brasital site were identified as the most relevant, given their greater potential to access and benefit from space.

Frame 5 - Stakeholders involved in other interests

Other interests	
Stakeholders group	Stakeholders
Academic (Schools, Universities, Researchers)	IFSP (Federal Institute of São Paulo), Anhembí Morumbi University, UNISR, UNIESP, Paula Souza State Center for Technological Education, São José School of Early Childhood, Primary and Secondary Education, CMEI Amasília Ribeiro Lopes, Municipal Council of Education (CME)
Community Groups	CEJAM Institute, APAE São Roque
Environmental Conservation Groups	AHPCE (Holistic Association for Ecological Community Participation – Núcleo da Terra), São Roque Orchid Association
Data Management Organizations	Municipal Department of Communication and Press; <i>São Roque Notícias</i> ; <i>Jornal da Economia</i>
Citizens and Individuals	Residents of Vila Aguiar neighborhood, Citizens of the Municipality of São Roque

Source: Authors

4.1 Discussion of Results

Throughout its history Brasital has played a central role in the socioeconomic and cultural development of São Roque - São Paulo, both influencing and being influenced by a wide range of stakeholders. According to Freeman (1984), stakeholders are individuals or groups who can affect or be affected by the actions of an organization. Within this context, Brasital brings together a diverse array of urban stakeholders, including municipal government, the local community, and heritage preservation agencies, each one playing strategic roles in the revitalization process.

Following the deactivation of its industrial activities, Brasital became a brownfield, an underutilized urban space with significant potential for redevelopment. Recognizing its historical

and cultural value, the municipal government acquired the Brasital complex in 1986 with the goal of transforming it into a public space dedicated to culture and tourism, thereby benefiting the local community. This initiative involved political actors committed to mobilizing resources and articulating strategies for the site's requalification.

Within stakeholder theory, the municipal government emerges as one of the key actors in this process. In addition to being the legal owner of the Brasital complex, the municipality acts as a project facilitator, playing a crucial role in securing funding and establishing partnerships with other levels of government, such as the Department for the Support of the Development of Tourist Resorts (DADE). This role involves not only resource mobilization but also the coordination of a collaborative network to ensure that the project aligns with the interests and demands of various stakeholder groups. By adopting a strategic stakeholder management approach, the municipal government promotes a requalification process that values historical heritage, fosters tourism, and integrates environmental sustainability principles (Bryson, 2004).

Condephaat is another critical stakeholder, given that Brasital is a protected historical site. The council oversees interventions in the complex, ensuring that renovations respect the original architectural and cultural features. This role is essential to maintain a balance between modernizing the space and preserving its historical identity, thereby strengthening the connection between the site's past and future.

DADE, an agency of the State Government of São Paulo, also plays a strategic role by allocating specific funds to municipalities classified as tourist resorts. These resources support projects that enhance the region's tourism potential, improve urban infrastructure, and encourage sustainable practices. Moreover, DADE's inclusion as a stakeholder reinforces the socioeconomic impact of the revitalization, transforming Brasital into a multifunctional space that benefits both the local community and visitors, aligning with best practices in public management as highlighted in the literature (Kaur & Lodhia, 2014; Lai & Ooi, 2015).

In the context of revitalizing spaces such as Brasital, financial resources represent a strategic funding mechanism. These funds can be allocated to the implementation of Nature-based Solutions (NbS) and the enhancement of Ecosystem Services (ES), such as green areas for recreation, stormwater management, and biodiversity promotion. Such strategies are widely recognized as effective tools to improve urban quality of life and foster climate resilience, as emphasized in studies that integrate NbS into urban planning (INTERACT-BIO, 2021; Millennium Ecosystem Assessment, 2005).

The use of such funds may include the development of sustainable infrastructure such as green corridors, green roofs, and permeable surfaces that contribute to stormwater drainage and microclimate regulation. These interventions not only mitigate environmental impacts but also provide economic and social benefits, aligning with global practices of sustainable urban revitalization (ICLEI, 2021; Parron et al., 2019).

Beyond environmental benefits, the use of DADE funds for the revitalization of Brasital can also strengthen stakeholder engagement—such as the local community, NGOs, and economic and cultural sectors. This approach fosters cross-sector collaboration, creating spaces that serve both public leisure and the development of sustainable tourism. Recent studies point out that active stakeholder engagement in projects of this nature is essential to ensure alignment with local interests and to maximize the benefits of ecosystem services (Freeman, 1984; Bryson, 2004).

The proposed revitalization of Brasital includes the implementation of Nature-based Solutions, such as green infrastructure that connects the complex to the Mata da Câmara Municipal Natural Park, forming a green corridor. This initiative involves collaboration with environmental sectors and NGOs interested in promoting sustainability and providing ecosystem services such as climate regulation, recreational areas, and biodiversity conservation. These elements reinforce the role of NbS as a key tool for sustainable urban requalification (Millennium Ecosystem Assessment, 2005; Selequim et al., 2024).

The local community of São Roque, including neighborhood associations, cultural groups, and educational institutions, plays an essential role in the revitalization of Brasital, being one of the project's primary stakeholders. The community has clear expectations regarding the benefits of the revitalization, such as the creation of spaces for social interaction, leisure, education, and cultural activities. Furthermore, cultural groups that already use the Brasital complex—or wish to participate in future initiatives—see the project as an opportunity to host events and preserve the site's historical legacy. Effective community engagement is crucial to ensure the space is embraced and valued, contributing to its long-term conservation (Bryson, 2004; Gallardo & Kaam, 2023).

Partnerships with Non-Governmental Organizations (NGOs) and environmental groups are also critical, as these stakeholders contribute a sustainability-oriented perspective to the project. Recent research highlights that the implementation of NbS in urban revitalization projects can promote sustainable practices such as the creation of green corridors, green roofs, and conservation areas (ICLEI, 2021; Parron et al., 2019). These interventions not only mitigate environmental impacts but also ensure ecological and social benefits, including climate regulation, stormwater management, and biodiversity conservation (Millennium Ecosystem Assessment, 2005).

Local cultural and tourism sectors also perceive Brasital as an opportunity to boost regional tourism and economic activity. Hotel and restaurant owners, tourism agencies, and local businesses emphasize the potential for new enterprises and the strengthening of sustainable tourism—aligned with case studies from Recife and Fortaleza, where urban planning projects incorporating NbS have improved quality of life and attracted investments (Gallardo et al., 2020; ICLEI, 2021).

Academic institutions and research centers, in turn, can contribute technical knowledge and support for environmental impact assessments, ecosystem service evaluations, and the monitoring of sustainable practices in the project. The literature emphasizes the role of universities in developing environmental education programs and creating solutions that foster urban resilience (Albert et al., 2021; Anderson & Gough, 2020).

Private investors and partners complete the group of essential stakeholders for Brasital's revitalization, offering financial resources and expertise to address structural and technological challenges. Global examples demonstrate that the revitalization of urban spaces focused on NbS can generate significant economic returns, such as new commercial and leisure areas that enhance local heritage and promote sustainable development (Mathey et al., 2015; Nadruz et al., 2018).

Frame 6 below provides a summarized analysis of the participation of key stakeholders in this process.

Frame 6 - Summary of Key Stakeholders in the Revitalization of Brasital

Stakeholder	Role and Contributions	Interests and Expectations
Municipal Government of São Roque	Coordinates and leads the revitalization project, seeks partnerships and financial resources.	Economic and social development, enhancement of historical and environmental heritage, improvement of the city's tourism infrastructure.
Condephaat	Oversees the project to ensure the preservation of Brasital's historical heritage.	Conservation of architectural and cultural features, compliance with historical preservation regulations.
Local Community and Cultural Groups	Actively participate in the use of the space and support cultural and leisure activities.	Improvement of social and public spaces, promotion of cultural and leisure activities, preservation of historical identity, and enhancement of local well-being.
Local Tourism and Commercial Sector	Promotes local tourism and stands to benefit from increased visitor flow after revitalization.	Growth in tourist numbers, expansion of local businesses, strengthening of sustainable tourism, and diversification of the local economy.
NGOs and Environmental Groups	Support the implementation of NbS and monitor sustainable practices to ensure environmental conservation.	Implementation of sustainable solutions (green corridors, green roofs), environmental preservation, and promotion of ecosystem services such as climate regulation and biodiversity.
Investors and Private Sector	Provide financial resources and technical expertise for the project's implementation.	Economic return potential, creation of new commercial and leisure spaces, and development of modern and sustainable infrastructure.
Educational and Research Institutions	Provide technical knowledge and conduct environmental impact studies, ecosystem service assessments, and monitoring of sustainable practices.	Development of research and environmental education programs, opportunities for hands-on student learning, and involvement in historical and ecological preservation projects.
Department for the Support of the Development of Tourist Resorts (DADE)	Provides strategic funding to municipalities with tourism potential, such as São Roque.	Support for projects that strengthen local tourism, promote sustainable economic development, and align with goals of historical and environmental heritage valorization.

Source: Authors

5 CONCLUSION

The integrated management of stakeholders is a key factor for the success of brownfield rehabilitation projects. This study presented the characterization of the main actors to be involved in the redevelopment of the Brasital brownfield which is an underutilized area located in a privileged zone of the urban perimeter of São Roque, Paraná.

A wide range of actors related to the revitalization of this brownfield was identified, including the municipal government, private sector, environmental agencies, financial institutions, technical professionals, academia, NGOs, key regulatory bodies, and civil society. Given the diverse and sometimes conflicting interests among these groups, due to the different perspectives of stakeholders, their involvement is crucial for shaping the implementation of Nature-based Solutions (NbS). These interests may vary as follows:

Development Interests: Groups such as developers and investors are driven by economic motivations, while public organizations aim to promote sustainability and sustainable tourism.

Professional Interests: Technical professionals and regulatory bodies—such as engineers and urban planners—focus on technical feasibility and regulatory compliance.

Regulatory Interests: Local authorities and environmental agencies prioritize legal compliance and the preservation of environmental and cultural heritage, which may impose limitations on certain commercial or structural activities.

Other Interests: The local community seeks leisure and cultural integration spaces, while environmental groups prioritize biodiversity and the provision of ecosystem services.

By integrating these perspectives, the proposed methodology may demonstrate that identifying and prioritizing stakeholder interests helps to tailor NbS strategies to meet specific demands. This could include, for instance, the development of green corridors to enhance biodiversity or community spaces to foster social engagement, while balancing regulatory constraints and economic goals.

This alignment facilitates the development of NbS-based projects that promote sustainability, reduce conflicts, and increase stakeholder buy-in factors that are essential for the long-term perpetuation of benefits.

The stakeholder mapping is essential to ensure that the project's development and implementation align with stakeholder interests and expectations, and that the space is effectively integrated into the urban fabric of São Roque.

The revitalization of Brasital holds the potential to boost tourism and strengthen the local economy, especially when cultural and business sectors are integrated into the process. The valorization of historical heritage, combined with the creation of new commercial and leisure spaces, may transform São Roque into a sustainable tourism destination, benefiting both the local population and investors.

By adopting a collaborative and sustainable management model, the project has the potential to become a reference for other Brazilian and international cities engaged in the revitalization of abandoned industrial areas, demonstrating the transformative power of NbS in building more resilient and equitable urban environments.

These findings contribute to the advancement of integrated project approaches that combine NbS with customized solutions tailored to specific stakeholder expectations, fostering greater engagement and ensuring the continuity of the initiative.

For future research, it is recommended to conduct interviews with the identified stakeholders to better understand their expectations for the area and assess the level of synergy between their visions and the NbS-based project.

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DECLARATIONS

AUTHOR CONTRIBUTIONS

- **Study Conception and Design:** Evandro Nogueira Kaam
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- **Formal Analysis:** Mateus Taraborelli
- **Funding Acquisition:** Not applicable

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DECLARATION OF CONFLICTS OF INTEREST

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We, Evandro Nogueira Kaam, Sara Coimbra da Silva, Amarilis Lucia Casteli Figueiredo Gallardo, and Mateus Taraborelli, hereby declare that the manuscript entitled "*Stakeholder Mapping for Brownfield Revitalization through Nature-based Solutions*" involves:

1. **Financial Ties:** We have no financial ties that could influence the results or interpretation of the study. No institution or funding entity was involved in the development of this research.
 2. **Professional Relationships:** We have no professional relationships that could affect the analysis, interpretation, or presentation of the results. No professional relationship relevant to the content of this manuscript has been established.
 3. **Personal Conflicts:** We declare no personal conflicts of interest related to the content of this manuscript.
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