Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

Scars in the Landscape: Urban Expansion Gradients in Petrópolis from the Perspective of Memory and Landscape Ecology

Emanuela Alves da Rocha
Doutoranda do Programa de Pós-Graduação em Urbanismo, UFRJ, Brasil
emanuela.rocha@fau.ufrj.br
ORCID iD 0000-0002-6268-6277

André Luís Paiva Gonçalves de Oliveira e Silva
Mestrando do Programa de Pós-Graduação em Urbanismo, UFRJ, Brasil
andre.silva@fau.ufrj.br
ORCID iD 0009-0009-8023-0271

Patricia Regina Chaves Drach
Professora Doutora, UERJ, Brasil
patricia.drach@gmail.com
ORCID iD 0000-0002-1548-4592

Submissão / Submission: 11/03/2025
Aceite / Acceptance: 04/05/2026
ROCHA, E. A. DA; SILVA, A. L. P. G. DE O. E; DRACH, P. R. C. Rasgos na paisagem: O gradiente construtivo no município de Petrópolis sob a perspectiva da memória e da ecologia. **Periódico Eletrônico Fórum Ambiental da Alta Paulista**, v. 22, n. 2, p. e2532, 2 ago.2026. DOI: 10.17271/1980082722220265551. Disponível em: https://publicacoes.amigosdanatureza.org.br/index.php/forum_ambiental/pt_BR/article/view/5551 Creative Commons Attribution (CC BY 4.0) License: https://creativecommons.org/licenses/by/4.0/

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

Rasgos na paisagem: o gradiente construtivo no município de Petrópolis sob a perspectiva da memória e da ecologia

RESUMO

Objetivo - Analisar o impacto da abertura de vias no processo de expansão urbana da localidade de Cascatinha, em Petrópolis, destacando a relação entre crescimento urbano, memória coletiva e preservação ambiental e patrimonial.

Metodologia - Utiliza abordagem territorial baseada em análise espaço-temporal, com apoio de cartografias e fotografias históricas, para compreender as dinâmicas de ocupação da área.

Originalidade/relevância - Insere-se no debate sobre os impactos da expansão urbana a partir da paisagem industrial, enfatizando a relação entre memória coletiva, centralidades urbanas e preservação ambiental.

Resultados - Identifica que a ineficiência de políticas habitacionais contribuiu para a expansão da área construída, reforçando a dependência de outros núcleos urbanos e impactando a centralidade histórica do bairro.

Contribuições teóricas/metodológicas - Propõe uma leitura do território baseada na relação entre tempo e espaço, a partir de um gradiente construtivo, demonstrando como a ocupação espontânea influenciou dinâmicas urbanas e ambientais ao longo da história.

Contribuições sociais e ambientais - Evidencia os desafios e potencialidades da preservação ambiental e patrimonial para o bairro Cascatinha, promovendo reflexões sobre memória coletiva e identidade local.

PALAVRAS-CHAVE : Paisagem; Patrimônio Industrial; Expansão Urbana; Ecologia; Memória Coletiva.

Scars in the Landscape: Urban Expansion Gradients in Petrópolis from the Perspective of Memory and Landscape Ecology

ABSTRACT

Objective – To examine the impact of road openings on the urban expansion process of the Cascatinha locality in Petrópolis, highlighting the relationships among urban growth, collective memory, environmental preservation, and heritage conservation.

Methodology – Adopts a territorial approach based on spatiotemporal analysis, supported by cartographies and historical photographs, to understand the dynamics of area occupation.

Originality/Relevance – Contributes to the debate on the impacts of urban expansion from the perspective of the industrial landscape, emphasizing the relationship between collective memory, urban centralities, and environmental preservation.

Results – Identifies that the inefficiency of housing policies contributed to the expansion of the built-up area, reinforcing dependence on other urban centers and impacting the historical centrality of the neighborhood.

Theoretical/Methodological Contributions – Proposes a territorial reading based on the relationship between time and space, through a constructive gradient, demonstrating how spontaneous occupation has influenced urban and environmental dynamics throughout history.

Social and Environmental Contributions – Highlights the challenges and potentialities of environmental and heritage preservation for the Cascatinha neighborhood, fostering reflections on collective memory and local identity.

KEYWORDS: Landscape; Industrial Heritage; Urban Expansion; Ecology; Collective Memory.

Rasgos en el paisaje: el gradiente constructivo en el municipio de Petrópolis desde la perspectiva de la memoria y la ecología

RESUMEN

Objetivo – Analizar el impacto de la apertura de vías en el proceso de expansión urbana de la localidad de Cascatinha, en Petrópolis, destacando la relación entre el crecimiento urbano, la memoria colectiva y la preservación ambiental y patrimonial.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

Metodología – Utiliza un enfoque territorial basado en el análisis espacio-temporal, con apoyo de cartografías y fotografías históricas, para comprender las dinámicas de ocupación del área.
Originalidad/Relevancia – Se inserta en el debate sobre los impactos de la expansión urbana desde la perspectiva del paisaje industrial, enfatizando la relación entre la memoria colectiva, las centralidades urbanas y la preservación ambiental.
Resultados – Identifica que la ineficiencia de las políticas habitacionales contribuyó a la expansión del área construida, reforzando la dependencia de otros núcleos urbanos e impactando la centralidad histórica del barrio.
Contribuciones Teóricas/Metodológicas – Propone una lectura del territorio basada en la relación entre el tiempo y el espacio, a partir de un gradiente constructivo, demostrando cómo la ocupación espontánea ha influido en las dinámicas urbanas y ambientales a lo largo de la historia.
Contribuciones Sociales y Ambientales – Evidencia los desafíos y potencialidades de la preservación ambiental y patrimonial para el barrio Cascatinha, promoviendo reflexiones sobre la memoria colectiva y la identidad local.

PALABRAS CLAVE: Paisaje; Patrimonio Industrial; Expansión Urbana; Ecología; Memoria Colectiva.

RESUMO GRÁFICO



ISSN 2966-2931 - v. 22, n. 1, 2026

1 INTRODUCTION

Over time, patterns of territorial appropriation shaped by human activities have increasingly prioritized urban lifestyles and the development of cities guided by technological notions of progress. A particular way of understanding space became consolidated around the economic activities developed within it, focusing primarily on productive labor and market-driven logics. While cities may be planned to guide particular forms of inhabitation and spatial appropriation, they also accommodate informality and unpredictability arising from the diverse beings that inhabit them. Natural resources have become progressively mediated and organized through production systems and networks, such as water supply infrastructures and food distribution chains. Both the consumption of and demand for these resources have become increasingly detached from human perception and awareness, given the ease with which people access water, dispose of waste, and engage in other everyday practices. At the same time, this mode of territorial appropriation leaves visible marks of inequality and often erases opportunities for specific segments of the population.

Seeking to stimulate new ways of analyzing territory centered on ecology and the valorization of local natural resources, a temporal reading of spatial appropriation combined with ecological principles that recognize the interdependence of natural, rural, and urban environments opens possibilities for alternative approaches in urbanism. In this sense, the urgent transition toward more nature-friendly cities and territories can be understood through a heterogeneous mosaic perspective that connects urban formation processes with the appropriation of landscapes and natural resources. Within this framework, roads and pathways may be interpreted as spatial ruptures that reorganize territorial relationships, by facilitating the movement of people and goods, while simultaneously reshape landscape dynamics, encouraging urban development along their margins.

Regarding the relationship between urban planning, heritage preservation, and landscape conservation from an ecological perspective, this study is grounded in the environmental and territorial complexity of Cascatinha, located in the second district of Petrópolis (Rio de Janeiro, Brazil). More nature-sensitive planning must take into account issues of social justice, collective memory, and environmental protection, all of which have been increasingly pressured by urban expansion and the absence of structural, multidimensional public policies capable of addressing the municipality's diverse realities. The case of Cascatinha combines historical elements of a centrality shaped by the establishment of an industrial complex along a watercourse, followed by the expansion of the built environment as new roads were designed and opened.

From a temporal and landscape perspective, it becomes evident that understanding historical heritage and collective memory is essential for an ecological approach to territorial planning. Such understanding can strengthen identity, sense of belonging, and the cultural value of places that have gradually been eroded over time. Territorial planning must therefore ensure that its actions confront the forces of urban homogenization. To achieve this, the historical dimensions of social memory and territorial occupation must be recognized and incorporated into planning processes.

ISSN 2966-2931 - v. 22, n. 1, 2026

2 OBJECTIVES

Using the city of Petrópolis, located in the mountainous region of the state of Rio de Janeiro (Brazil), as a case study, this article proposes a critical analysis of its territory, with particular emphasis on Cascatinha, the municipality's second district. Through the concept of a built-environment gradient, the study examines the process of municipal expansion based on the axis of the União e Indústria Road, industrial activities, and factors that add complexity to contemporary planning, such as the occupation of risk-prone areas and urban sprawl. The use of the gradient as an analytical framework aims to explore ecological and regional dynamics from an integrative and autonomous perspective, while highlighting the relationship between the development of urban nuclei and the pressure exerted on natural areas.

Considering different historical periods of the city, the structuring role of the railway, the União e Indústria Road, and industrial activities demonstrates their importance for understanding the municipal occupation process. Furthermore, the article seeks to highlight elements of the landscape and local memory that directly contribute to understanding the social and cultural value of space.

3 METHODOLOGY

This article adopts a literature review as a preliminary stage and as the basis for constructing a theoretical narrative involving environmental perception, territorial morphology, landscape, and ecological practices. Books, scientific articles and other academic publications are analyzed within these thematic fields in order to establish a critical framework applicable to the case study of Petrópolis.

Once the União e Indústria Road was defined as the basis for investigating the relationship between the opening of transportation routes and urban expansion, a literature review of studies dedicated to the historical and geographical processes of the formation and growth of Petrópolis and its surrounding region was conducted. The photographic analysis based on the comparison of different historical periods was facilitated by the Moreira Salles Institute historical archives. Historical representations of the road, the Companhia Petropolitana de Tecidos textile factory and the surrounding landscape constituted important research materials.

Finally, geoprocessing tools were employed to spatialize the debate concerning urban expansion by locating key analytical elements, including transportation routes, topography, built-up areas and historical infrastructures such as factories, workers' villages and the railway line. Developed and analyzed using the open-source software QGIS, the cartographies, produced at different scales, aim to explore, within the proposed study area, the visual representation of a built gradient that encompasses and reveals distinct temporalities of urban infrastructure, including the Cascatinha Textile Factory, its workers' housing complexes, the railway line, the road network and contemporary constructions. Quantitative data, provided by the Brazilian Institute of Geography and Statistics (IBGE), particularly demographic information, complemented the analysis.

4 TERRITORY, NATURAL REGION AND GRADIENT

ISSN 2966-2931 - v. 22, n. 1, 2026

The urban formation process and the development of human communities has historically been associated with the capacity to inhabit territory, particularly from a technological perspective. The emergence of new historical periods is directly linked to transformations in ways of inhabiting space through new technologies. Lefebvre (1970) explains the trajectory of different forms of spatial appropriation and their relationship with economic activities, while also considering the emergence of technologies.

From the process of sedentarization and the emergence of the first human communities within the political city, infrastructures such as aqueducts enabled permanent settlement. Later, in the commercial city, exchange and trade became central to human life, leading to the creation of urban spaces dedicated to economic activities. During that period, a transition from the agrarian to the urban took place. Interpersonal relations, economic organization and the division of labor were transformed, affecting both individual and collective bodies.

According to Lefebvre (1970), this process culminates in what he calls the critical zone. Features such as rural exodus, urban concentration, the expansion of the urban fabric and the complete subordination of agrarian life to urban dynamics—closely linked to the market logic and the capitalist production of space—affect the equitable management of territory and reinforce the perception of nature as something to be dominated by human beings.

Throughout this process, however, some approaches, although less influential, sought to promote forms of planning more closely associated with nature, such as the Garden City movement at the end of the nineteenth century. Subsequently, Hall (2007) explains that these ideas gained broader scale through the work of biologist Patrick Geddes, who proposed the concept of the natural region and the understanding of territory through the valley section model. For Geddes, planning should begin with the recognition of a region's natural resources, which, together with human responses to space, shape the cultural landscape.

From the perspective of contemporary cities, however, urban environments and metropolitan areas, often regarded as symbols of development, tend to tip the balance toward urban priorities, weakening natural and rural environments and rendering them increasingly susceptible to urban expansion. In broad terms, the dissociation of rural areas from municipal responsibilities and the limited effectiveness of protected-area regulations—many of which are excessively flexible and poorly enforced—have favored the loss of the struggle, within this productivist logic, against the dominance of urban-centered public policies. Whether in large metropolitan centers or in small and medium-sized cities, rurality and natural environments have increasingly been marginalized.

Urban sprawl, environmental degradation, inequality and socio-spatial segregation are recurring themes in critiques of urban development. Although these issues are frequently addressed in urban and territorial planning, practical advances toward full democratic access to space remain limited. Nevertheless, contemporary climate conditions, affecting both urban and rural areas, have intensified and exposed inequalities in access to and enjoyment of the city, from its physical spaces to its most ordinary social relations.

In this context, it becomes possible to approach multiple agendas through the lenses of territory and landscape. Landscape, in particular, embodies the notion of a totality of

ISSN 2966-2931 - v. 22, n. 1, 2026

accumulated historical processes and therefore reveals relationships of cause and effect as well as continuity over time. By shifting territorial analysis toward a more ecological rather than exclusively productivist perspective, it becomes possible to recognize flows, movements and practices through a framework that is more compatible with nature, while simultaneously uncovering alternative interpretations of territorial formation. These different arrangements compose what Forman (2008) defines as a territorial mosaic, in which distinct forms of interaction between humans and nature transform spaces and create heterogeneous systems of integration.

Such territorial mosaics encourage reflection on how urbanization and urban expansion promote the technification of landscapes and the loss of ecological connectivity. The production of urban space over time becomes a vector of ecological transformation, altering environmental security patterns and imposing significant pressures on natural systems. These dynamics suggest that the notion of progress commonly associated with urbanization often produces an unsustainable metabolism between society and nature.

Debates concerning how urban expansion reshapes ecological flows and ecosystem services contribute to understanding the historical construction of both cities and landscapes. Liu et al. (2025a) draw attention to conservation and ecological restoration strategies linked to ecological source zoning and the identification of bottlenecks and barriers within landscapes. According to the authors, compact urban forms facilitate the implementation of more ecological land-use strategies. However, it is essential to consider the social dimensions and environmental injustices embedded in ecological debates, so as not to overlook the ways in which capitalism appropriates nature through the discourse of sustainability, transforming it into a commodity.

Recognizing the importance of integrating multiple dimensions of ecological performance into landscape, planning brings systems and networks to the forefront of territorial analysis, while simultaneously revealing the limitations of fragmented and compartmentalized approaches. Interconnections and network relationships—such as water systems and transportation networks—when viewed from an ecological perspective, challenge hierarchical structures and open possibilities for new forms of territorial cooperation.

Within this context, the urban-to-rural transect offers a graphical interpretation of territory that captures the continuity of diverse forms of spatial articulation. It considers elements such as buildings, land use, streets and other physical characteristics across both urban and rural environments. Talen (2002) explains that it is possible to observe gradients of urban intensity, while simultaneously promoting connections between urban elements and ecological systems within an integrated framework. According to the author, urban features should strengthen environmental systems rather than place additional stress upon them.

Although the methodology establishes a set of zones—with distinct land-use and land-cover features—and proposes the identification of urban forms and patterns, this study does not seek to apply a rigid zoning framework. Instead, flexibility is required to avoid forcing every element into predefined categories. Talen (2002) highlights the challenges posed by the rhythms of everyday urbanism and their conflicts with long-term planning policies. She also emphasizes the difficulties in addressing ongoing problems due to the lack of a common planning language capable of incorporating local diversity and natural dynamics.

ISSN 2966-2931 - v. 22, n. 1, 2026

By questioning the culture of separation that characterizes both urban planning practice and knowledge production—including the separation between environmental planning and transportation planning, as well as the segregation of land uses—Talen (2002) identifies fragmentation as a major obstacle to holistic and integrated planning. In this regard, the urban-to-rural transect emerges as an integrative system capable of connecting urban development processes while balancing spatial order and diversity. According to Talen (2002), the transect fosters collaboration between urbanists and environmentalists, expanding opportunities to evaluate growth patterns through ecological principles and bringing together human and natural ecology.

As a methodological tool, the author argues that a linear section across a landscape enables the understanding of diverse systems, habitats, community associations and ways of inhabiting territory. Recent studies have employed the transect approach to investigate vulnerable areas, urban expansion and landscape dynamics, exploring its potential as a tool for territorial management and the formulation of public policies, particularly those aimed at environmental preservation (Liu et al., 2025b).

Moreover, although traditional urban-to-rural transect representations tend to organize and classify urban forms into distinct typologies, many contemporary studies acknowledge the need to adapt both the conceptual framework and graphical representation to local realities through case-study approaches. As an analytical instrument, the transect helps overcome a simplistic urban-rural dichotomy by revealing the relationships and continuities that unfold across territory, including ecological processes that operate across multiple scales regardless of whether they occur in urban or rural settings.

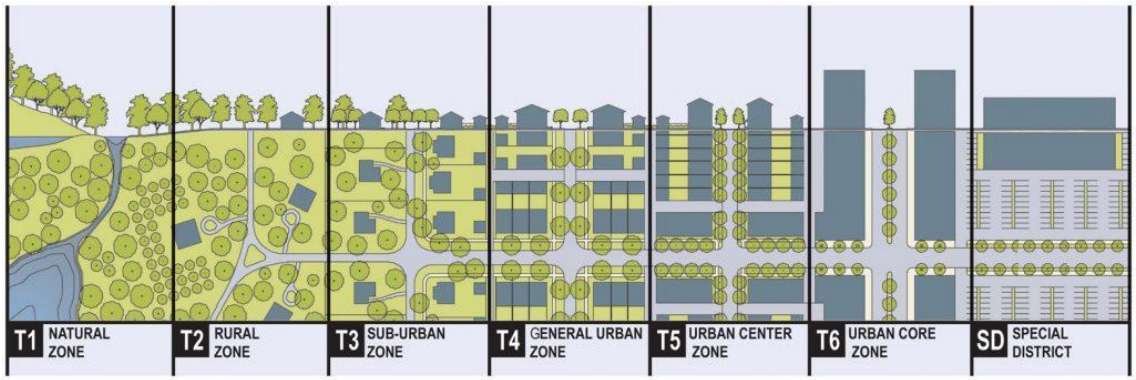
Liu et al. (2025b) further expand the concept of the transect beyond urban morphology by incorporating biodiversity, ecological integrity and anthropogenic pressure. Their work demonstrates the methodological relevance of the concept for different urban contexts and highlights its potential contributions to both landscape ecology and contemporary territorial planning. The authors show that the transect can help identify critical zones where biodiversity is particularly vulnerable, often corresponding to urban centers. At the same time, it reveals that biodiversity loss is not spatially uniform but rather highly heterogeneous, even within urban environments themselves.

However, locating the phenomena revealed by the transect within their historical context, as well as recognizing the political and economic dimensions inherent to spatial conflicts—both in anthropocentric terms and in relation to society–nature interactions—is essential for a more comprehensive analysis. The present study seeks to achieve this by employing the transect to illustrate the urban form of Cascatinha from both temporal and spatial perspectives.

Thus, Figure 1 should be understood as a generic representation that does not fully capture the complexity of the transition between more urbanized and less urbanized areas.

ISSN 2966-2931 - v. 22, n. 1, 2026

Figure 1 – Urban-to-rural gradient



Source: CATS, s.d.

Drawing upon discussions developed by the Centre for Transition Studies (CATS), Rocha (2021) argues that, in the context of Brazilian cities, traditional transect representations often fail to accommodate urban forms such as informal settlements (favelas). The author highlights that features such as soil permeability and the absence of urban vegetation may be found across different realities, but must always be interpreted through the lenses of inequality and environmental injustice.

In this sense, when applied to a specific territorial context, the gradient can reveal how multiple land uses and land-cover patterns are integrated, as well as their impacts on ecological processes. From a landscape ecology perspective, Ortiz-Báez, Cabrera-Barona and Bogaert (2021) identify that different land uses and land-cover types may be understood as patches when they constitute spatial units with homogeneous features or as corridors, when they are linear elements that contribute to landscape connectivity. Focusing on the Latin American context, the authors explain that historical, political and economic influences, from the colonial period to the present day, help describe both the morphological and functional dimensions of cities. Drawing upon discussions with other scholars, they argue that contemporary Latin American cities are fragmented and diffuse. According to the authors, the construction of new interurban highways has facilitated the occupation of peripheral areas and promoted dispersed urbanization. Within the urban-rural interface, they identify a mixed landscape characterized by the coexistence of residential fragments belonging to different socioeconomic groups alongside urban services, agricultural land and natural areas. Using the gradient approach to examine the Metropolitan District of Quito, Ecuador, the authors identified landscape composition features and territorial configuration patterns through the analysis of six gradients. They have concluded that the method contributes to the systematization of specific characteristics, opportunities and vulnerabilities associated with urban pressure on rural environments.

Thus, the gradient approach incorporates the concept of the territorial mosaic. The prominence of horizontality in both concepts enables a reinterpretation of territorial elements and their associated effects. Within this framework, Forman's (2008) interpretation of roads and transportation routes as disruptions in geography is particularly relevant. According to the author, the opening of these linear corridors signals a future process of occupation along their margins and subsequent urban expansion. The impacts of such occupations on everyday urban mobility, together with their environmental and public health consequences, are central to debates that question the effects of road-oriented development on cities. Combined with

ISSN 2966-2931 - v. 22, n. 1, 2026

dynamics such as the privatization of spaces and the concentration of services, the present case study examines the influence of the União e Indústria Road on the development of Petrópolis and focuses on a territory that embodies diverse features, resulting from a process of historical sedimentation.

The impacts of these forms of occupation on urban mobility patterns, as well as their environmental and health consequences, are part of broader discussions concerning the effects of automobile-oriented planning. Aiello et al. (2024) demonstrate that urban highways act as physical barriers that not only fragment the urban fabric, limiting pedestrian and social connectivity between neighborhoods, but also negatively affect community interactions and social cohesion, including from the perspective of racially exclusionary urban planning. The authors describe these dynamics as the barrier effect and the weakening of social ties. In the context of American cities, and through a historical analysis of urban development shaped by residential racial segregation, Aiello et al. (2024) argue that the discourse of urban renewal functioned, in practice, as a mechanism for isolating Black neighborhoods, alongside other practices such as redlining and discriminatory housing policies.

From an environmental perspective, the ecological effects of high-traffic zones include habitat fragmentation and the expansion of areas influenced by transportation networks. These impacts have become increasingly visible as exposure maps reveal that vast territories are affected by road traffic at levels capable of altering ecological and biodiversity dynamics on a global scale (Strien; Grêt-Regamey, 2025). Furthermore, regarding public health, epidemiological literature indicates that residential proximity to highways and traffic corridors is associated with higher exposure to air pollutants, with evidence of adverse effects on respiratory and cardiovascular diseases among urban populations. These findings reinforce the need to integrate urban health analyses into studies of transportation infrastructure and territorial planning (Saldiva, 2018; Yu et al., 2025; Debelu et al., 2024).

The concept of gradients as a means of interpreting territorial phenomena is not new to the fields of urbanism and environmental comfort. Atmospheric pressure gradients and thermal gradients are common examples. Since a gradient represents the rate of variation of a physical quantity across a spatial dimension and in a given direction, this research adopts the urban-rural gradient as a representation of land-use and land-cover patterns in order to understand, through different realities, the evolution of urban occupation in the Cascatinha region. In this sense, a temporal built gradient demonstrates the capacity to narrate the history of urban development in a particular locality, highlighting historical markers that stimulated patterns of occupation.

The representation of a temporal gradient contributes not only to reconstructing the history of land use and land-cover but also to opening new possibilities for analyzing variations in ecological patterns through reflections on the impacts of urbanization on vegetation growth, species diversity and ecological functions. This article constitutes a first step toward constructing such a gradient for the case study of Cascatinha, while simultaneously revealing the relevance of this form of representation for theorizing the historical formation of space and its social, political and historical dimensions. Moreover, these findings may contribute to supporting future territorial planning strategies.

ISSN 2966-2931 - v. 22, n. 1, 2026

4 HISTORICAL SEDIMENTATION AND THE SCARS IN THE PETRÓPOLIS LANDSCAPE

The process of occupation of the area that today comprises the city of Petrópolis presents dynamics like those observed in the colonization of Brazil. Particularly along the Brazilian coastline, the presence of Indigenous peoples from different ethnic groups marked the earliest forms of human occupation in the territory. Netto (2007) explains that the first inhabitants of Petrópolis were the Goitacá people, who later sought refuge in other areas because of the exploitation and control imposed by Portuguese colonization. The region corresponding to present-day Petrópolis was known as the "Backlands of the Crowned Indians" (Sertão dos Índios Coroados). Nevertheless, the officially narrated history of the city begins with the opening of the Proença Trail (Caminho do Proença) and the New Road (Caminho Novo), a route created to facilitate the inland expansion of the country by connecting Rio de Janeiro, then the capital, to the regions of Minas Gerais and São Paulo. Subsequently, and quite prominently, the historiography of this territory came to emphasize its occupation by the Imperial Family. However, Netto (2007) points out that the presence of Indigenous artifacts along the rivers of Petrópolis reinforces the argument that the routes later used by colonizers had originally been opened by Indigenous peoples during their migratory movements.

The territory was progressively scarred by anthropocentric dynamics associated with land exploitation. Whether through the Proença Trail or later, the opening of the New Road, these transportation corridors generated demands for new uses, activities and places along their margins, including support points and resting areas for travelers and their animals. Along both the Normal Road of Estrela (Estrada Normal da Estrela)—corresponding to the mountain ascent section of the New Road—and other access routes, large estates and farms emerged to provide services to travelers. Subsequently, Emperor Pedro I acquired the Córrego Seco Farm, corresponding to the area of Petrópolis' First District. Following his death, the property was transferred to Pedro II (Ambrozio, 2012).

Due to the mild climate of the Serra Fluminense region, Petrópolis became a place of interest to Emperor Pedro II, the Imperial Family, and the aristocratic elite of the period. At the Emperor's request, the Austrian engineer and Major Júlio Frederico Koeler was commissioned to design and implement an occupation plan for the territory, completed in 1846. Koeler organized the area into quarters designated for colonization and oriented the frontages of plots toward riverbanks. The importance attributed to natural elements from the very conception of the plan established watercourses as structuring elements of the landscape in a city that initially occupied the valley floor. In this context, the city's main roads—nowdays functioning as arterial routes—follow the courses of the main rivers: Quitandinha, Palatino and Piabanha. Over time, however, these rivers underwent significant interventions, including channelization, straightening and the removal of fluvial islands.

Laeta, Fernandes and Fernandes (2023) report that, in 1854, a new cartographic representation based on Koeler's plan was produced. While Koeler's original planning was limited to what is now understood as the First District, Otto Reimarus' second map extended to other areas of the city. Entitled Imperial Colony of Petrópolis (Reduced for Visitors' Guide), the document contained information like that of the 1846 map. The authors explain that although the map illustrates the addition of ten new quarters, its title suggests that Reimarus adopted a

ISSN 2966-2931 - v. 22, n. 1, 2026

reduced perspective of the city, representing only those areas considered relevant to visitors. While the document records urban expansion, it likely did so in a limited manner, as it does not appear to have been intended as a planning instrument. Nor does it indicate the industrial activity that would gain prominence in subsequent decades.

According to Martins, Barcellos and Drach (2022), once Petrópolis became the capital of the Empire during the summer months, it was expected that innovations and technological advances in transportation would follow. Whereas Petrópolis had initially served as a passageway to Minas Gerais, the consolidation of the territory through Imperial action contributed to its administrative establishment as a city in 1857. The dichotomy between center and periphery can already be observed in Koeler's plan, including from an income perspective. The Imperial Village Quarter (Quarteirão Vila Imperial) was reserved for elites and privileged families, concentrating services and functions and consolidating itself as a centrality that remains important till today. By contrast, the colonial quarters, occupied by immigrants, experienced limited decentralization over time through the emergence of small commercial establishments and industrial nuclei (Drach et al., 2020; Martins, Barcellos & Drach, 2022). Industrial activity in Petrópolis also benefited from public policies implemented at other governmental levels. A historical survey conducted by the Metropolitan Region Development Foundation of Rio de Janeiro (FUNDREM, 1986) notes that the city's proximity to the capital enabled integration with the metropolitan economy, with productive activities concentrated in the mountains while company headquarters, capital and raw materials remained in Rio de Janeiro.

The opening of highways and railway lines accompanied the growing demand for transporting raw materials and distributing the production of factories—predominantly paper and textile industries—that gradually became established in the city. Railways also played an important role in the movement of people, particularly factory workers (Martins, Barcellos & Drach, 2022). Extending from Porto Mauá, in Magé, through Petrópolis toward Minas Gerais, the railway was constructed in stages, the first section being inaugurated between 1852 and 1854. Reaching Petrópolis in 1881 through the Alto da Serra neighborhood, the railway only expanded to other districts and established additional stations in 1886, when the section toward Areal was inaugurated. Martins, Barcellos, and Drach (2022) explain that the daily Petrópolis–Rio de Janeiro–Petrópolis commute became so common that the railway acquired the nickname "the husbands' train."

The União e Indústria Road stands out among the transportation infrastructures connecting Petrópolis to Minas Gerais. Stretching 144 km between Petrópolis and Juiz de Fora and inaugurated in 1861 by Emperor Pedro II, it was the first macadamized road in Latin America. Within Petrópolis, the road crosses all five districts, creating connectivity among urban centers that developed primarily around industrial facilities. These industries, in turn, stimulated mixed land uses through the creation of workers' villages, commercial establishments, services and leisure activities. While this perspective supports debates concerning the control exercised over workers by factory owners through a lifestyle confined to the locality, contemporary residents often express nostalgia for a past characterized by local investment and a higher-quality urban environment. The contrast between past and present is rooted in the marginalization currently associated with various aspects of these districts, including the deterioration of public spaces,

ISSN 2966-2931 - v. 22, n. 1, 2026

the concentration of services and commerce in the First District and a sense of community and belonging that survives, mainly in collective memory.

In the following century, the BR-040 highway was inaugurated in 1928, following a route outside the urban nuclei already developed in Petrópolis. According to Martins, Barcellos and Drach (2022), this highway contributed to the decline of railway transportation, particularly after the launch of the National Highway Plan in 1944, during the Vargas administration. It also encouraged the relocation of industries toward neighborhoods closer to the highway, such as Bingen. Supported by both rail and road connectivity, industrial activity in Petrópolis became firmly established from the second half of the nineteenth century onward, particularly along riverbanks. In addition to providing hydroelectric power, water played an essential role in several stages of paper and textile production (Martins, Barcellos & Drach, 2022).

The development of urban centers around industrial infrastructures stimulated occupation and urban expansion over time. In Cascatinha, industrial activity drove economic and demographic growth, consolidating the district as an important urban center. However, the closure of the factory in the mid-1960s had a profound impact on local economic and social dynamics, resulting in unemployment and declining incomes, that became visibly inscribed in the landscape.

Founded in 1873 by the Cuban entrepreneur Bernardo Caymari, the Companhia Petropolitana de Tecidos in Cascatinha extended its activities beyond industrial production by implementing infrastructure and services such as a potable water network. According to FUNDREM (1986), workers' housing was constructed during the factory's early years, totaling 138 houses and 25 rooms for single workers by 1891. The Foundation also notes that recurring housing shortages generated continuous demand for new housing as the company acquired additional land. Over time, facilities such as medical service, daycare center, general store and school were established. Throughout the factory's operation—from its consolidation to its decline in the 1960s—workers' strikes, infrastructure improvements, housing adaptations to building regulations, public lighting installations and the emergence of labor legislation marked local history (FUNDREM, 1986). Following the factory's closure, the former workers' village gradually evolved into a popular residential neighborhood.

Interpreting the União e Indústria Road as a scar in the landscape and a catalyst for urbanization and sprawl along its margins, three main patterns of construction growth in previously vegetated areas can be identified. The first is associated with self-built housing developed by populations unable to access the formal real estate market. The second involves residents who obtained housing through public housing policies. A third process concerns the proliferation of gated communities aimed at middle and upper-income groups, which have transformed roadside dynamics by increasing population density and automobile ownership, often undermining urban mobility. Whether occurring along riverbanks, roads or railway lines, urbanization in these areas shares a common characteristic: spontaneity. In this context, Zainotte (2020) highlights environmental impacts associated with hillside occupation in the district, including susceptibility to landslides and other socio-environmental vulnerabilities.

Within the framework of the proposed gradient, based on Cascatinha and its industrial development, a new means of critically understanding its history and spatial configuration emerges by comparing urban growth with demographic and memory-related perspectives.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

Taking the opening of the União e Indústria Road, the railway line and the establishment of the Companhia Petropolitana de Tecidos as foundational milestones, the processes associated with land subdivision and the anticipation of new occupations become evident as drivers of urbanization. Figure 2 seeks to highlight these different layers through a temporal perspective on urban expansion in the study area.

Figure 2 – Temporal Gradient of Territorial Occupation



Source: Elaborated by the authors (2024).

The survey of land use and land-cover in the area that currently corresponds to the centrality of Cascatinha, conducted by FUNDREM (1986), makes it possible to analyze the process of territorial appropriation and to construct this morphological gradient from the perspective of historical sedimentation. The confluence of the Piabanha and Itamarati rivers shaped the occupation process of the area, which developed along their banks, particularly around transportation infrastructures such as the União e Indústria Road, the Saudade Road and the railway line, as well as industrial facilities that depended on water for production.

From the earliest mapping efforts, it is possible to observe what FUNDREM itself described as a “sparse occupation along the route,” occurring along the edges of these roads and pathways. Occupying large portions of both riverbanks, the infrastructure of the Companhia Petropolitana de Tecidos, until 1886, consisted only of its original headquarters, industrial sheds and workers’ townhouses. The Foundation also highlights the presence of densely vegetated hillsides in the map, which stand in contrast to the future patterns of occupation.

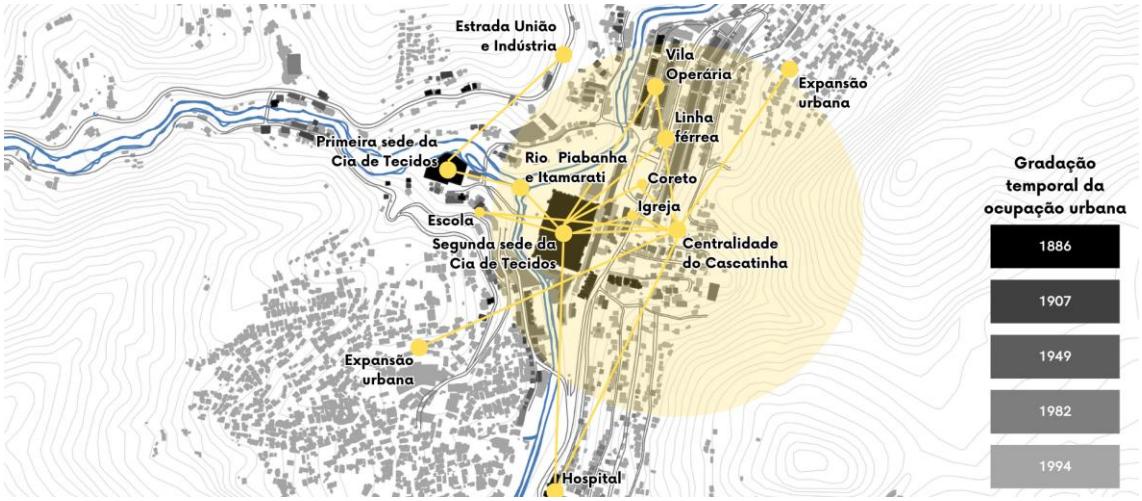
Between 1887 and 1907, FUNDREM (1986) records the appearance of new buildings along the roads and riverbanks, as well as important facilities that supported workers’ daily life, including a hospital, a school (1892) and a church (1894). Prior to this period, infrastructure necessary for industrial operations had also been constructed, such as bridges over the rivers in 1887, connecting the two factory complexes and facilitating access to workers’ housing. In 1889, a movable dam was built on the Piabanha River and was later reconstructed in concrete in 1939. Between 1907 and the late 1940s, additional facilities such as the bandstand and the parish house were built, while occupation gradually expanded toward the previously vegetated hillside. New buildings also appeared along both the União e Indústria Road and the Saudade Road.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

During the 1970s, a subdivision project was approved within the company's property, leading to the construction of new buildings both on the newly created lots and along the riverbanks. New streets opened in the lower portions of the hillsides and near the rivers, paving the way for future occupation. Complementarily, the mapping produced by the Municipality of Petrópolis for its cadastral plan in 1994 identified many additional buildings, highlighting the process of urban expansion and increasing urbanization of this peripheral area, whose historical centrality had been structured around industrial activities. Figure 3 brings together the different elements that compose this landscape and urban ambience, taking the textile factory in Cascatinha as its central reference.

Figure 3 – Articulation of different landscape elements throughout the occupation process



Source: Elaborated by the authors (2024).

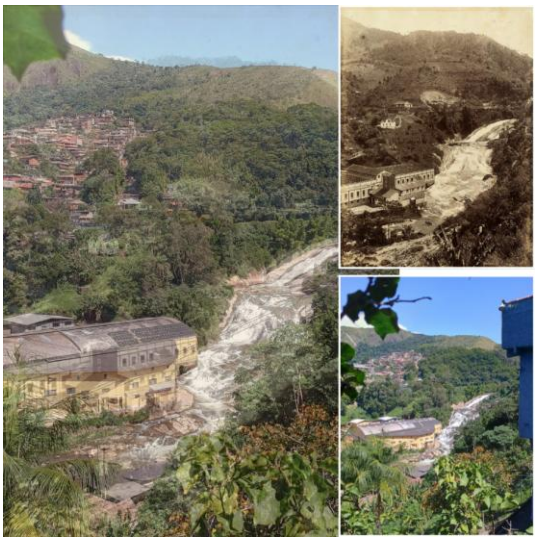
The decline in urban quality and infrastructure provision in Cascatinha has contributed to contemporary commuting dynamics, making the União e Indústria Road the principal axis connecting residents to other districts of the municipality.

The process of urban expansion, viewed through the perspective of a land-use and land-cover gradient, can be examined through different analytical frameworks. Figures 4 and 5 complement this discussion by comparing and superimposing photographs from different periods, contributing to an understanding of the historical sedimentation of the territory. Whether through the installation of railway infrastructure or through the factories themselves, industrial dynamics have exerted—and continue to exert—a significant influence on the landscape.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

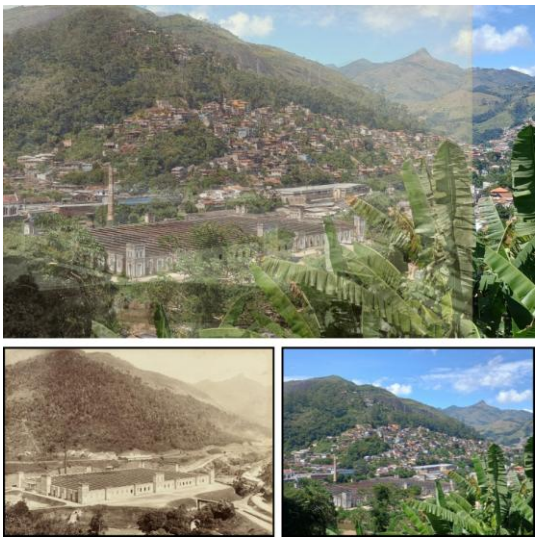
ISSN 2966-2931 - v. 22, n. 1, 2026

Figure 4 – Comparative Analysis of Urban Occupation in the Vicinity of the First Headquarters of the Companhia Petropolitana de Tecidos



Source: Elaborated by the authors (2024).

Figure 5 – Comparative Analysis of Urban Occupation in the Vicinity of the Second Headquarters of the Companhia Petropolitana de Tecidos



Source: Elaborated by the authors (2024).

From the perspective of cultural heritage, Guazzelli and Almeida (2023) discuss the impact of industrial activity within the heritage field, considering its influence on socio-cultural and environmental dynamics. In their analysis of industrial and railway complexes in the state of São Paulo, the authors identify a process of urban development and city formation directly associated with railway lines. Between the late nineteenth and early twentieth centuries, population growth, the increase in goods circulation and improvements in urban infrastructure, driven by what became known as the Coffee Cycle in São Paulo, influenced processes of urbanization and aesthetic renewal of cities and buildings, resulting in the construction of a unique cultural landscape (Guazzelli; Almeida, 2023).

By arguing that industrial heritage cannot be reduced to its imposing structures of architectural value alone, Guazzelli and Almeida (2023) reclaim the notions of territory and landscape as fundamental dimensions of heritage. In doing so, they attribute an identity value to industrial elements and infrastructures, recognizing them as essential components of everyday life and of working-class history. For the authors, the concept of cultural landscape must be considered because it "can be understood not merely as a physical place, but as a set of ideas, sensations, and feelings that are constructed from a place and the elements that constitute it" [1] (Guazzelli; Almeida, 2023, p. 22).

Once an analytical framework has been established that highlights the different layers and agents acting upon the territory throughout history, it becomes possible to identify elements that reinforce dynamics harmful both to urban life and to the environment. The combined effect of ineffective housing policies and the opening of new transportation routes is

[1] English translation by the authors.

ISSN 2966-2931 - v. 22, n. 1, 2026

one example, as it facilitates access to natural and rural areas, encouraging processes such as the occupation of previously vegetated hillsides and the settlement of legally protected riparian zones.

In the case of Petrópolis, this issue becomes particularly evident when considering the city's historical susceptibility to landslides and flooding. Within the context of climate change and its spatial consequences for urban areas, Godoy, Benini and Silva (2025) emphasize the importance of understanding these dynamics considering socioeconomic and infrastructural conditions, revealing the heightened vulnerability of peripheral areas. According to the authors, climate vulnerability is far from being a natural condition; rather, it is the result of political and urban planning decisions, often guided by capital accumulation and by the treatment of the city as a commodity. It is, therefore, necessary to reflect on how urban design and planning either incorporate or disregard the natural features of places, as well as to evaluate who ultimately benefits from these decisions.

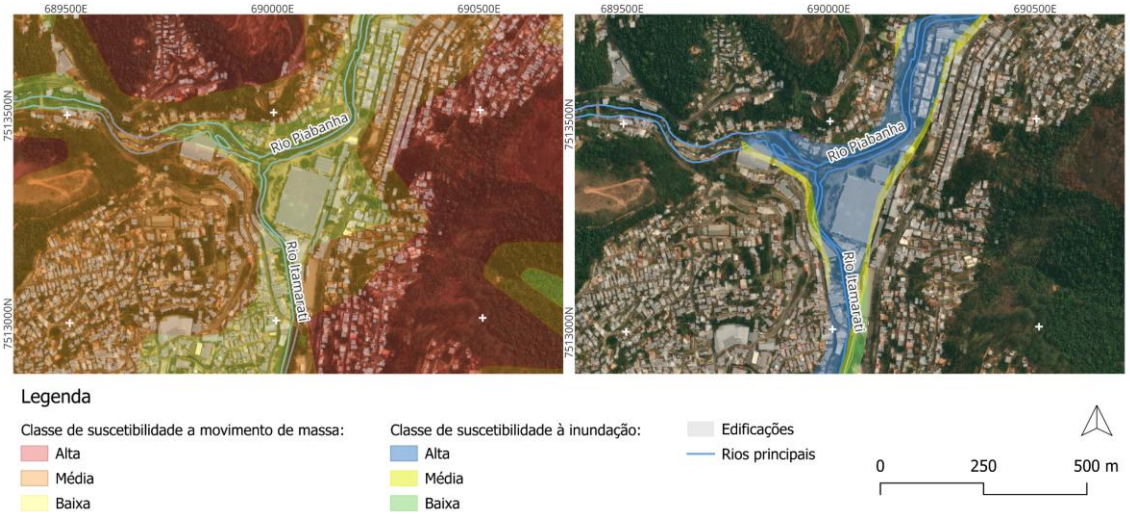
In Cascatinha, the observed pattern is one of urban development and land-cover that perpetuates conditions of environmental vulnerability. Discussing the relationship between urbanism and environmental fragility, Genaro, Pinese and Aledo (2024) highlight the importance of considering river basins as a fundamental unit for spatial planning, as well as for the management of water and environmental resources. Figure 6 illustrates the different levels of environmental risk identified in Cascatinha.

Although the First District concentrates features that intensify the risk of landslides and flooding—due to the concentration of its road network and built fabric within the valley floor and their subsequent expansion toward the prominent slopes that define the local landscape—the occurrence of disasters in other districts highlights the importance of understanding such events through the lens of environmental injustice. Schvarsberg, Paiva and Rocha (2024) analyze the history of rainfall-related disasters in Petrópolis, with particular attention to the two catastrophic events that occurred in 2022, which together resulted in the loss of 242 lives. According to the authors, the persistence of an urban mobility model centered on private automobiles exacerbates environmental risks and deepens social inequalities. In addition to contributing to soil sealing, road infrastructure in many areas of Petrópolis was made possible through interventions in watercourses, including channel straightening and the narrowing of riverbeds.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

Figure 6 – Landslide and Flood Susceptibility in the Study Area



Source: Elaborated by the authors (2024).

The creation of spaces capable of accommodating fluctuations in river volume and absorbing excess water during extreme rainfall events remains constrained by the extensive spatial demands associated with automobile circulation and parking. This challenge is further compounded by the absence of effective housing policies capable of preventing technically unsupported urban expansion into landslide-prone areas, particularly in a context where part of the population is unable to afford safe housing within the formal real estate market. Both the alteration of watercourses, resulting from mobility-related decisions and the degradation of river basins through deforestation, driven by the occupation of hillsides by populations with limited residential alternatives, contribute to the conditions that made disasters such as those of 2022 possible.

From another perspective, demographic growth in the vicinity of the factory can be observed through the spatialization of census data from 2000, 2010 and 2022 (IBGE, 2000; 2010; 2022). Census tracts constitute the territorial units used for data collection and are defined according to criteria such as clear geographic boundaries, preferably established by natural or built physical barriers and ease of access for census operations. Their size is designed to optimize data collection efficiency and, in urban areas, generally encompasses between 300 and 800 households. In addition, census tract boundaries seek to maintain relative homogeneity regarding population characteristics and land use.

Considering these aspects, Figure 7 presents a comparative analysis of private households by census tract, making it possible to observe both their growth over time and the need for subsequent subdivisions of these territorial units. The União e Indústria Road, together with the river system, functions as a physical barrier and population growth along its margins culminated, by 2022, in the creation of census tract boundaries that closely follow its route.

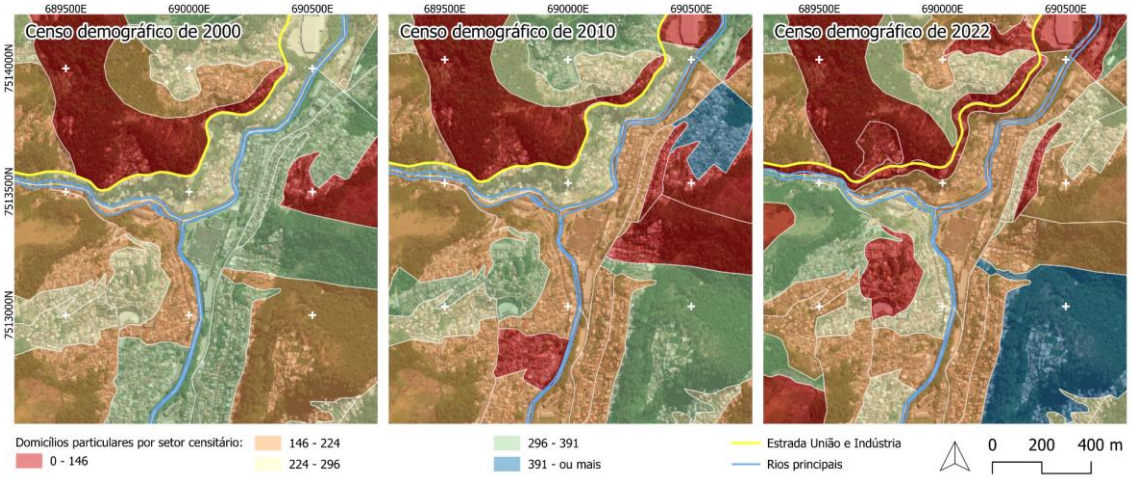
The experience of the landscape reveals nuances of the processes of spatial formation and urbanization, in which the space-time dimension offers an opportunity to understand particular dynamics of social accommodation. In Petrópolis, industrial activity fostered a process of urban expansion that, although not originally anticipated in successive urban plans, was accompanied by a form of urban structuring largely driven by private initiatives. Housing,

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

services and essential infrastructure developed in the immediate surroundings of industrial facilities, facilitating workers' availability to the factories while also enabling the reproduction of the labor force through the consolidation of family groups within the locality.

Figure 7 – Demographic Analysis of Private Households by Census Tract Between 2000 and 2022 in the Study Area



Source: Elaborated by the authors (2024).

Correia (2001) explains that the model of the workers' village (vila operária) gained prominence as a housing solution for the urban poor, positioned in opposition to favelas and tenement housing due to its association with order, hygiene and decency. According to the author, the factory effectively created a "new city" and possessed considerable autonomy in managing local life (Correia, 2001). From this perspective, it is possible to identify how capital, through urban planning practices, shaped patterns of social accommodation whose effects remain visible today, particularly in the nostalgic memories preserved by former workers and their descendants.

Correia (2001) further notes that the term workers' village gradually fell into disfavor, especially from the 1930s onward, when it was replaced by expressions such as working-class neighborhood, popular neighborhood, or popular housing developments. This shift reflected attempts to distance these settlements from criticisms regarding restrictions on individual and family freedoms, as well as the reinforcement of workers' dependence upon factory owners. During this period, labor struggles and denunciations concerning living and working conditions became increasingly common, a reality that was also present in Cascatinha. FUNDREM (1986) reports that, during the 1930s, the factory administration expressed dissatisfaction with obligations imposed by labor legislation, including the payment of workers' vacation benefits. Subsequently, between the 1940s and the 1960s, the decline of industrial activity led to the transfer of several facilities and services to public administration. At the same time, the expansion of subdivisions and the opening of new roads along the edges of the surrounding hillsides encouraged urban growth in a largely unplanned manner, resulting in a neighborhood whose contemporary urban quality remains strongly marked by a historical dependence on private capital.

6 CONCLUSION

ISSN 2966-2931 - v. 22, n. 1, 2026

Although the role of private capital in shaping territory was not the central focus of this study, its influence became evident in multiple ways. Whether as a driving force behind urban expansion among populations excluded from formal real estate markets or through the industrialization processes, that generated new urban centralities throughout the history of Brazilian cities, the case of Cascatinha highlights the need to consider the multiple layers and complex articulations that compose the landscape.

The temporal gradient of the built environment developed in this study demonstrates that, beyond urban sprawl over hillsides and along transportation corridors—a common process in contexts marked by ineffective housing policies—the transition between urban, rural and natural spaces is becoming increasingly difficult to perceive. Lefebvre's description of urban development culminating in a critical zone finds clear parallels in the historical trajectory of Cascatinha, where contemporary manifestations include the deterioration and precarization of urban space.

As an initial step toward a broader investigation of land occupation processes in Petrópolis, this research underscores the importance of examining former industrial areas throughout the municipality. In this regard, the União e Indústria Road remains a key axis for future studies. The privatization of urban space, both historically and in the present day, constitutes an important theme for continuing investigations into the "scars" inscribed upon the city's landscape. From industrial complexes to contemporary gated communities, the opening of transportation corridors reveals the need for urban planning strategies capable of reducing inequalities while fostering more nature-sensitive forms of development.

Any territorial intervention aimed at promoting a more ecological approach must consider the landscape scale and recognize territory as the result of the sedimentation of multiple temporalities, territorialities and social practices. Social memory emerges as an essential component of this debate, contributing to the understanding of both the challenges and the potentialities that shape the territorial complexity of the present.

7 REFERENCES

AIELLO, Luca Maria; VYBORNOVA, Anastasia; JUHÁSZ, Sándor; SZELL, Michael; BOKÁNYI, Eszter. Urban highways are barriers to social ties. **Proceedings of the National Academy of Sciences**, v. 122, n. 10, p. e2408937122, 2024. DOI: 10.48550/arXiv.2404.11596. Disponível em: https://arxiv.org/pdf/2404.11596. Acesso em: 25 jan. 2026.

AMBROZIO, Júlio César Gabrich. O território da enfiteuse e a cidade de Petrópolis-RJ, Brasil. **Revista Electrónica de Geografía y Ciencias Sociales**, v. 16, n. 39, p. 1-7, 2012.

CENTER FOR APPLIED TRANSECT STUDIES (CATS). The Transect. **CATS**, s.d. Disponível em: https://transect.org/transect.html. Acesso em: 04 abr. 2024.

CORREIA, Telma. De vila operária a cidade-companhia: as aglomerações criadas por empresas no vocabulário especializado e vernacular. **Revista Brasileira de Estudos Urbanos e Regionais (RBEUR)**, n. 4, p. 83-98, 2001.

DEBELU, Desi; MENGISTU, Dechasa Adare; ASCHALEW, Alemayehu; MENGISTIE, Bizatu; DERIBA, Wagene. Global public health implications of traffic related air pollution: systematic review. **Environmental Health Insights**, v. 18, p.

ISSN 2966-2931 - v. 22, n. 1, 2026

11786302241272403, 2024. DOI: 10.1177/11786302241272403. Disponível em: https://pubmed.ncbi.nlm.nih.gov/39192968/. Acesso em: 25 jan. 2026.

DRACH, Patricia; SILVA BARBOSA, Gisele; ALVES BARCELLOS, Fernanda; MARTINS, Thaissa; MELO ARAÚJO, Júlia; FREITAS, Letícia. Evolução urbana do centro histórico de Petrópolis: processo de arqueologia da paisagem 1860-2020. **Revista de Morfologia Urbana**, [S. l.], v. 8, n. 2, p. e00150, 2020. DOI: 10.47235/rmu.v8i2.150.

FORMAN, Richard. **Urban regions**. Nova Iorque: Cambridge University Press, 2008.

FUNDREM – Fundação para o Desenvolvimento da Região Metropolitana do Rio de Janeiro. **Cascatinha: recuperação e revitalização**. Rio de Janeiro: FUNDREM, 1986.

GENARO , Vinicius; PINESE, José Paulo Peccinini; ALEDO, Antonio. Mapeamento da fragilidade ambiental e a manutenção dos serviços ecossistêmicos em uma região de Mata-Atlântica no Pontal do Paranapanema - SP. **Periódico Eletrônico Fórum Ambiental da Alta Paulista**, *[S. l.]*, v. 20, n. 5, 2024. DOI: 10.17271/1980082720520245273. Disponível em: https://publicacoes.amigosdanatureza.org.br/index.php/forum_ambiental/article/view/5273. Acesso em: 24 jan. 2026.

GODOY, Jeane Aparecida Rombi de; BENINI, Sandra Medina; SILVA, Allan Leon Casemiro da. Segregação socioespacial e vulnerabilidade climática nas periferias urbanas. **Periódico Eletrônico Fórum Ambiental da Alta Paulista**, *[S. l.]*, v. 21, n. 3, p. e2508, 2025. DOI: 10.17271/1980082721320256223. Disponível em: https://publicacoes.amigosdanatureza.org.br/index.php/forum_ambiental/article/view/6223. Acesso em: 24 jan. 2026.

GUAZZELLI, Bárbara Gonçalves; ALMEIDA, Maísa Fonseca de. O território, a paisagem e a modernização ferroviária: os desafios contemporâneos da preservação do Patrimônio Industrial. **Transportes, Servicios Y Telecomunicaciones**, 2023, no 52, p. 15-41.

HALL, Peter. **Cidades do amanhã: uma história intelectual do planejamento e do projeto urbanos no século XX**. São Paulo: Perspectiva, 2007.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Censo Demográfico 2000: Agregados por Setores Censitários**. Rio de Janeiro: IBGE, 2000. Disponível em: https://www.ibge.gov.br/estatisticas/sociais/administracao-publica-e-participacao-politica/9663-censo-demografico-2000.html?edicao=10192&t=resultados. Acesso em: 04 abr. 2024.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Censo Demográfico 2010: Agregados por Setores Censitários**. Rio de Janeiro: IBGE, 2010. Disponível em: https://ftp.ibge.gov.br/Censos/Censo_Demografico_2010/Resultados_do_Universo/Agregados_por_Setores_Censitarios/. Acesso em: 04 abr. 2024.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Censo Demográfico 2022: Agregados por Setores Censitários**. Rio de Janeiro: IBGE, 2022. Disponível em: https://www.ibge.gov.br/estatisticas/sociais/administracao-publica-e-participacao-politica/22827-censo-demografico-2022.html?edicao=41852&t=resultados. Acesso em: 04 abr. 2024.

LAETA, Tainá; FERNANDES, Manoel do Couto; FERNANDES, Mário Gonçalves. The Historical Cartography of Petrópolis and a Synchronic Geographic Analysis for the 19th Century (1846-1861). **Revista cartográfica**, 2023, no 106, p. 147-168.

LEFEBVRE, Henri. **A Revolução Urbana.** Belo Horizonte: Editora UFMG, 1970.

ISSN 2966-2931 - v. 22, n. 1, 2026

LIU, Naiyi; LIU, Zihan; KILUNDA, Felista Kasyoka; LIU, Yanqi; QIN, Chao. Urban-rural gradient in biodiversity intactness across global cities. **Ecological Informatics**, p. 103350, 2025b. DOI: 10.1016/j.ecoinf.2025.103350. Disponível em: https://www.sciencedirect.com/science/article/pii/S1574954125003590?via%3Dihub. Acesso em: 24 jan. 2026.

LIU, Sui; XIE, Yifan; LU, Yanchi; LIU, Yaolin; TONG, Zhaomin; LIU, Yanfang. Impact of urban expansion on the temporal adaptation and spatial connectivity of ecological security patterns: insights from a rapidly urbanizing metropolitan area. **Ecological Processes**, v. 14, n. 1, p. 84, 2025a. DOI: 10.1186/s13717-025-00651-8. Disponível em: https://link.springer.com/article/10.1186/s13717-025-00651-8. Acesso em: 24 jan. 2026.

MARTINS, Thaissa; BARCELLOS, Fernanda; DRACH, Patricia. Caminhos para além de Petrópolis: das estradas reais às rodovias. **Periódico Técnico e Científico Cidades Verdes**, v. 10, n. 27, 2022.

NETTO, J. **Antecedentes históricos**. Instituto Histórico de Petrópolis, Petrópolis, 08 mai. 2007. Disponível em: https://ihp.org.br/curso-de-historia-de-petropolis/#:~:text=A%20denomina%C3%A7%C3%A3o%20%E2%20%80%9CSert%C3%A3o%20%20dos%20%C3%8Dndios,(1)%2C%20seriam%20os%20antigos. Acesso em: 23 ago. 2024.

ORTIZ-BÁEZ, Paola; CABRERA-BARONA, Pablo; BOGAERT, Jan. Characterizing landscape patterns in urban-rural interfaces. **Journal of Urban Management**, 2021, vol. 10, no 1, p. 46-56.

ROCHA, Emanuela Alves da. **Urbanismo sintomático: os efeitos do rodoviarismo na saúde e na alimentação**. 2021. Trabalho de Conclusão de Curso (Graduação em Arquitetura e Urbanismo)- Departamento de Arquitetura e Urbanismo, Universidade do Estado do Rio de Janeiro, Petrópolis, 2021.

SALDIVA, Paulo. **Vida urbana e saúde: os desafios dos habitantes das metrópoles**. São Paulo: Editora Contexto, 2018.

SCHVARSBERG, G.; PAIVA, A. L.; ROCHA, E. Mobilidades Pós-Antropocênicas: o potencial político de especulações projetuais em paisagens carrocêntricas. **Revista de Morfologia Urbana**, [S. l.], v. 12, n. 2, 2025. DOI: 10.47235/rmu.v12i2.427.

STRIEN, Maarten J.; GRÊT-REGAMEY, Adrienne. Global expansion of the ecological impact of extra-urban road traffic. **Nature Sustainability**, v. 8, n. 11, p. 1294-1303, 2025. DOI: 10.1038/s41893-025-01637-2. Disponível em: https://www.nature.com/articles/s41893-025-01637-2#code-availability. Acesso em: 25 jan. 2026.

TALEN, Emily. Help for urban planning: the transect strategy. **Journal of Urban Design**, v. 7, n. 3, p. 293-312, 2002.

YU, Qinchi; GUO, Zihao; BAI, Lijun; LIU, Huimeng; XIE, Cuiyao; LIU, Dandan; CHANG, Yuxue; WANG, Yaxin; LI, Ming; LEI, Jian; WU, Shaowei. Residential Proximity to Major Roadways and Risk of Allergic Respiratory Outcomes: A Systematic Review and Meta-analysis. **Clinical reviews in allergy & immunology**, v. 68, n. 1, p. 69, 2025. DOI: 10.1007/s12016-025-09072-z. Disponível em: https://pubmed.ncbi.nlm.nih.gov/40694158/. Acesso em: 25 jan. 2026.

ZAINOTTE, Milena. O Distanciamento entre Teoria e Prática do Plano Diretor: o Caso do Distrito de Cascatinha, Petrópolis/RJ. Anais **VI Encontro da Associação Nacional de Pesquisa e Pós-graduação em Arquitetura e Urbanismo**. Brasília: UNB, 2020.

Periódico Eletrônico Fórum Ambiental da Alta Paulista
Electronic Journal Environmental Forum of Alta Paulista

ISSN 2966-2931 - v. 22, n. 1, 2026

DECLARATIONS

CONTRIBUTION OF EACH AUTHOR

Emanuela Alves da Rocha: participated in all stages of the study, including Study Design and Conception, Data Curation, Formal Analysis, Research, Methodology, Writing – Initial Draft, Writing – Critical Review, Final Review and Editing, and Supervision.

André Luís Paiva Gonçalves de Oliveira e Silva: contributed to the Conception and Design of the Study and to the Formal Analysis.

Patricia Regina Chaves Drach: contributed to the Review and Final Edition of the manuscript and supervised the study.

DECLARATION OF CONFLICTS OF INTEREST

We, **Emanuela Alves da Rocha, André Luís Paiva Gonçalves de Oliveira e Silva, and Patricia Regina Chaves Drach**, declare that the manuscript entitled "**Rifts in the Landscape: the Construction Gradient in the Municipality of Petrópolis from the Perspective of Memory and Ecology**":

1. **Financial Links**: Does not have financial ties that could influence the results or interpretation of the work.
2. **Professional Relations**: There are no professional relationships that could impact the analysis, interpretation, or presentation of results.
3. **Personal Conflicts**: There are no personal conflicts of interest related to the content of the manuscript.