

53rbano

MISCELÁNEA
MISCELLANEOUS

MAYO 2026 / NÚMERO 53
ISSN IMPRESA: 0717 - 3997
ISSN ELECTRÓNICA: 0718 - 3607





53rbano

MISCELÁNEA

MISCELLANEOUS

MAYO 2026 / NÚMERO 53

ISSN IMPRESA: 0717 - 3997

ISSN ELECTRÓNICA: 0718 - 3607

REVISTA DEL DEPARTAMENTO DE PLANIFICACIÓN Y DISEÑO URBANO /
UNIVERSIDAD DEL BÍO - BÍO / CONCEPCIÓN / CHILE



UNIVERSIDAD DEL BÍO BÍO



**FACULTAD de
ARQUITECTURA
CONSTRUCCIÓN
y DISEÑO**
UNIVERSIDAD DEL BÍO BÍO



DEPARTAMENTO DE
PLANIFICACIÓN Y
DISEÑO URBANO



Programa de Información Científica
Concurso Fondos de Publicación de Revistas Científicas 2018
Proyecto Código: FP180007

EDITORIA RESPONSABLE / Editor in Chief
Stella Schroeder / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
stella.schroeder@ubiobio.cl

COMITÉ DE REDACCIÓN / Editorial board
SERGIO BAERISWYL RADA / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
IGNACIO BISBAL GRANDAL / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
IVÁN CARTES SIADÉ / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
HÉCTOR GAETE FERES / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
MARÍA ISABEL LÓPEZ MEZA / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
AARÓN NAPADENSKY PASTENE / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
FRANCISCO NUÑEZ CERDA / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.
FRANCISCO SABATINI DOWNEY / Departamento de Planificación y Diseño Urbano, Facultad de Arquitectura,
Construcción y Diseño, Universidad del Bío - Bío.

COORDINACIÓN EDITORIAL/assistant editor
JOCELYN VIDAL RAMOS / Facultad de Arquitectura, Construcción y Diseño, Universidad del Bío - Bío.
javidal@ubiobio.cl

ASISTENTE EDITORIAL/editorial assistant
ALMENDRA ÁLVAREZ RÍOS / Facultad de Arquitectura, Construcción y Diseño, Universidad del Bío-Bío
calvarezz@ubiobio.cl

COMITÉ CIENTÍFICO EDITORIAL/editorial board
PABLO ALLARD SERRANO. Universidad del Desarrollo. Chile.
ARTURO ORELLANA OSSANDON. Pontificia Universidad Católica de Chile. Chile.
MABEL ALARCÓN RODRÍGUEZ. Universidad de Concepción. Chile.
JORGE INZULZA CONTARDO. Universidad de Chile. Chile.
ELISA CORDERO JAHR. Universidad Austral de Chile. Chile.
ROBERTO GOYCOOLEA PRADO. Universidad de Alcalá. España.
ZAIDA MUXÍ MARTÍNEZ. Universidad Politécnica de Catalunya. España.
ESTER HIGUERAS GARCÍA. Universidad Politécnica de Madrid. España.
ALFREDO ANDIA STELZER. Florida International University. EEUU.
CLARA IRAZÁBAL ZURITA. University of Missouri. EEUU.
DANIEL GONZÁLEZ ROMERO. Universidad de Guadalajara. México.
EDUARDO SOUSA GONZÁLEZ. Universidad Autónoma de Nueva León. México.
HELGA VON BREYMANN MIRANDA. Universidad de Costa Rica. Costa Rica.
SAMUEL VÉLEZ GONZÁLEZ. Universidad Pontificia Bolivariana de Medellín. Colombia.
KARINA BORJA. Universidad Católica Ecuador. Ecuador.
ALICIA NOVICK. Universidad Nacional de General Sarmiento. Argentina.

DIRECCIÓN DE ARTE Y DIAGRAMACIÓN/ art director and layout
IGNACIO A. SÁEZ ARANEDA

TRADUCCIÓN AL INGLÉS/English translation
KEVIN WRIGHT

CORRECCIÓN DE ESTILO/proofreader
TANIA VIDAL RAMOS

GESTIÓN WEB/webmaster
KARINA LEIVA

SECRETARÍA/administration
GINA GELMI ORTIZ

IMAGEN DE PORTADA/cover image
RÍOS DE CHILE 2026, FUENTE: NELSON ARIAS JIMÉNEZ

INDEXACIONES/indexation
Scopus, Scielo, Emerging Sources Citation Index, Redalyc, ERIHPLUS, DOAJ, EBSCO, AVERY Index, Latindex Catálogo 2.0,
Dialnet, REDIB, REBIUN. URBANO forma parte de ARLA, Asociación de Revistas Latinoamericanas de Arquitectura.



Scopus

SciELO Chile



reDalyC.org

ERIHPLUS

DOAJ

EBSCO

AVERY INDEX

latindex
catálogo
2.0

Dialnet

REDIB

REBIUN
Red de Bibliotecas
Universitarias

ARLA

LA CONSTRUCCIÓN HISTÓRICA DEL ÁREA CENTRAL
DE LOS SALTOS DEL LAJA, CHILE: UN PAISAJE TURÍSTICO DUAL
THE HISTORICAL CONSTRUCTION OF THE CENTRAL AREA OF
LOS SALTOS DEL LAJA, CHILE: DUAL TOURIST LANDSCAPE

Daniela García-Letelier
Ignacio Bisbal-Grandal

MOVILIDAD URBANA SOSTENIBLE Y CONSERVACIÓN PAISAJÍSTICA:
EL CASO DE LA LOMA LA BELLA DURMIENTE EN LIMA, PERÚ
SUSTAINABLE URBAN MOBILITY AND LANDSCAPE CONSERVATION:
THE CASE OF BELLA DURMIENTE HILL IN LIMA, PERU

Dalith Lizeth Quispe-Torre
Oscar Fredy Cervantes-Veliz
Igor Villares-de-Carvalho
Analucia Riveros-Cayturo

DESARROLLO URBANO Y PUEBLOS INDÍGENAS: PIEDRA RETXIKURA Y PROYECTO
INMOBILIARIO "LOMAS DEL LAGO VILLARRICA", CHILE
URBAN DEVELOPMENT AND INDIGENOUS PEOPLES: THE RETXIKURA ROCK AND THE
"LOMAS DEL LAGO VILLARRICA" REAL-ESTATE PROJECT, CHILE

Ignacio Felis
Matthew Caulkins

TIPOLOGÍAS DE QUEBRADAS URBANAS PARA LA PLANIFICACIÓN
ADAPTATIVA AL CAMBIO CLIMÁTICO EN LOJA, ECUADOR
TYPOLOGIES OF URBAN RAVINES FOR ADAPTIVE
PLANNING TO CLIMATE CHANGE IN LOJA, ECUADOR

Claudia Salomé González-Roldán
Mercedes del Cisne Torres-Gutiérrez
Fabián René Reyes-Bueno
Galina Mercedes Segarra-Morales

ASENTAMIENTOS AUTOPRODUCIDOS EN EL DESIERTO DEL BAJO PIURA, PERÚ:
ENTRE ESCALA EXTRACTIVA Y ESCALA DEL RIESGO
SELF-PRODUCED SETTLEMENTS IN THE BAJO PIURA DESERT, PERU:
BETWEEN THE EXTRACTIVE AND RISK SCALES

Patricia Caldas-Torres
Edith Aranda-Dioses

MOTIVOS Y PRÁCTICAS DE DESPLAZAMIENTO PARA EL ACCESO A SERVICIOS EN CONTEXTOS
LATINOAMERICANOS: UN REFUERZO DE LA CENTRALIZACIÓN EN LAS CIUDADES DEL SUR DE CHILEO
MOBILITY MOTIVES AND PRACTICES TO ACCESS SERVICES IN LATIN AMERICAN CONTEXTS: A
REINFORCEMENT OF CENTRALIZATION IN THE CITIES OF SOUTHERN CHILE

Francisco Ramón Maturana-Miranda
Fernando Andrés Peña-Cortés
Sergio Soza-Amigo
Jorge Eduardo Cárdenas-Pizarro

LA ESCENA PATRIMONIAL: HACIA UNA GESTIÓN
INTEGRADA DEL VACÍO URBANO EN CENTROS HISTÓRICOS
THE HERITAGE SCENE: TOWARD AN INTEGRATED
MANAGEMENT OF URBAN VOIDS IN HISTORIC CENTERS

Alma Andrea Ponce-Sánchez

SEGREGACIÓN RESIDENCIAL EN UNA CIUDAD INTERMEDIA MEXICANA: DESIGUALDAD
SOCIOESPACIAL EN CULIACÁN ROSALES
RESIDENTIAL SEGREGATION IN A MEXICAN INTERMEDIATE CITY: SOCIO-SPATIAL
INEQUALITY IN CULIACÁN ROSALES

Gerhard Aguilar-Torres
Ricardo Gómez-Maturano

NOMBRAR Y NORMAR: TENSIONES ENTRE
LA PLANIFICACIÓN URBANA Y LA PRODUCCIÓN DE NATURALEZA
NAMING AND REGULATING: TENSIONS BETWEEN
URBAN PLANNING AND PRODUCTION OF NATURE

Claudia Cerda-Inostroza
Francisco De-la-Barrera-Melgarejo
Mauro Fontana-Flores



STELLA SCHROEDER ¹**Reconstruction or Recurrence? The dilemma of resilience in a country facing multiple threats**

Chile is currently at a critical crossroads, where mega fires, flash floods, and recurrent seismic activity have exposed the profound limitations of territorial planning that has historically prioritized profitability and expansion over mitigating localized risks (Camus, Arenas, Lagos, & Romero, 2016). This persistent gap between operational emergency management and urban planning regulations reveals a culture of reactive resistance that, far from being effective, perpetuates the vulnerability of the most exposed communities (Rinaldi & Bergamini, 2020). Despite our extensive experience in reconstruction processes, urban planning instruments continue to operate under traditional recurrence studies that often ignore the analysis of multiple criteria, thus consolidating public policies that are fragmented or, in the worst case, absolutely absent in the most critical territories (González González, Baeriswyl Rada & Zazo Moratalla, 2020). This institutional disconnect not only results in an overlap of competences among the different levels of government but also encourages planning that privileges mass, standardized housing production over the comprehensive recovery of the territory and its morphological memory (Jaque-Castillo, Ojeda-Leal & Muñoz-Berríos, 2025).

Historically, this predominantly engineering perspective has subordinated the interdisciplinary approach needed to manage risk in complex ways, resulting in recovery processes that lack a solid institutional framework to address the new dynamics of the contemporary urban landscape (Villagra Islas & Felsenhardt Rosen, 2015). After every catastrophic event, the same question arises, challenging the discipline of urbanism: are we building resilience, or are we simply rebuilding pre-existing vulnerability? The Chilean State's response to disasters has shown remarkable effectiveness in the immediate response, but a structural deficiency in the long-term vision. Reconstruction policy has tended to support an interpretation based on a residential and short-term physical reconstruction, focused on the rapid provision of housing solutions and the reinstatement of basic services, but detached from the institutions that should facilitate a deep social and territorial recovery (Inzulza Contardo, Curihuinca Curihuinca, Easton Vargas & Pérez Tello, 2022; Sandoval-Díaz & Cuadra-Martínez, 2020). The fundamental problem of this model is that, by prioritizing the speed of housing delivery over a rigorous morphological and territorial analysis, the population ends up being resettled under the same risky conditions that caused the disaster, perpetuating a cycle of risk that society is forced to absorb without real adaptation tools.

Reconstruction should not be limited to responding to physical damage but should constitute a holistic process through which society can absorb the phenomenon, resist it, and, fundamentally, adapt to the new climatic realities. The question about the persistence of vulnerability finds a crude answer in the obsolescence of our planning instruments; the Communal Regulatory Plans in Chile are over 20 years old on average, which makes regulations not a protection tool, but an active risk factor (León, Winckler, Vicuña, Guzmán & Larraguibel, 2023).

Recent studies have shown that an alarming proportion of current plans allow and even encourage densification in areas identified as flood-prone or at high risk of landslides (Jaque-Castillo et al., 2025; León et al., 2023). In coastal cities, the situation is particularly critical: up to 60% of the urban area faces a high risk of wildfires. However, more than 75% of this area is zoned for high-density residential uses, omitting the threat in the planning and actively contributing to the social construction of risk (Jaque-Castillo et al., 2025).

This reality transforms our peripheries into territories where institutional fragmentation leaves citizens at the mercy of increasingly extreme climate emergencies, as was evident in the February 2024 mega-fire in Valparaíso. This event revealed the lethal combination of the climate crisis and urban informality. This condition has been aggravated by more recent fires, such as the one in February 2026, which destroyed around 800 homes in the communes of Penco and Tomé. This vulnerability has been shaped by the coexistence of extensive forest plantations, rugged topographies, and expansive urbanization, which has accelerated the growth of urban-forest interface areas. In the central part of the country,

¹ Doctora Arquitectura y Urbanismo
Académica e investigadora del Departamento de planificación y diseño urbano, Facultad de Arquitectura, Construcción y Diseño
Editora Revista Urbano.
Universidad del Bío-Bío, Concepción, Chile.
<https://orcid.org/0000-0001-8591-2719>
stella.schroeder@ubiobio.cl

DOI: <https://doi.org/10.22320/07183607.2026.29.53.00>

Figura 1, 2 Ríos de Chile 2026. Fuente: Nelson Arias Jiménez

there has been what experts call a “fire weather” characterized by extreme heat, prolonged drought, and wind gusts that, when interacting with informal settlements, create explosive conditions that are difficult to control (Baleriola, Espejo, Ibacache & Yáñez-Urbina, 2024; Castañeda-Meneses, 2025).

It is imperative to recognize that informality is not merely a land tenure problem, but a profound structural vulnerability. Homes in these areas often fail to comply with technical fire safety standards. They are located in geographies that are difficult for emergency services to access, where the lack of regulation allows flammable vegetation and housing structures to coexist without protective barriers (Garay Moena, Castillo, Tapia & Vergara, 2019; González-Mathiesen, March & Yunis-Richter, 2023). Therefore, resilience in these contexts requires much more than engineering works or firebreaks; it requires a real integration of risk management into territorial planning, a process that has historically been limited by the rigidity of the Chilean institutional context (González-Mathiesen et al., 2023). Resilience must stop being a rhetorical concept used to validate the ability to “endure” disasters and become a proactive adjustment process that combines technical preparedness with effective exposure reduction through land-use adaptation (Leal Filho et al., 2018).

For the country to stop rebuilding vulnerability, it is necessary to move towards operational, multidimensional post-disaster planning. This implies, first of all, an urgent update of the Regulatory Plans that integrate dynamic risk maps and strictly prohibit densification in critical flood or fire areas. Secondly, Chile urgently needs a new coastal institutional framework that recognizes the coastline’s natural dynamics and the irreversible effects of sea-level rise, one that goes beyond the current administrative vision. Similarly, the management of informality must be addressed, recognizing that the urban interface is a space that requires specific regulations and differentiated housing safety standards. Finally, the morphological analysis must be placed at the center of the reconstruction so that it is not a repetition of past mistakes, but a structural improvement of the urban fabric that considers the spatial configuration as a mitigation tool. Disasters are not “natural” events, but the result of human decisions in the occupation of the territory; ignoring the logic of the landscape and the warnings of science turns the next catastrophe into a planned consequence.

Baleriola, E., Reyes Espejo, M. I., Espinoza Ibacache, J., y Yáñez-Urbina, C. (2024). Aprender a (con)vivir desde los desastres y desafíos contemporáneos. *Psicoperspectivas*, 23(1). <https://doi.org/10.5027/psicoperspectivas-vol23-issue1-fulltext-3174>

Camus, P., Arenas, F., Lagos, M., y Romero, A. (2016). Visión histórica de la respuesta a las amenazas naturales en Chile y oportunidades de gestión del riesgo de desastre. *Revista de Geografía Norte Grande*, (64), 9-20. <https://dx.doi.org/10.4067/S0718-34022016000200002>

Castañeda-Meneses, P. L. (2025). Megafire February 2024 in the Conurbation of the Province of Valparaíso, and Wildland-Urban Interface Zones, Chile. *Revista Kawsaypacha: Sociedad y Medio Ambiente*, (16). <https://doi.org/10.18800/kawsaypacha.202502.D012>

Garay Moena, R., Castillo, M., Tapia, R., y Vergara, J. (2019). Territorio, viviendas y áreas de incendios forestales de interfaz: localidades periurbanas en torno al Gran Santiago, Chile. *Seminario Internacional de Investigación en Urbanismo [SIU] XI*. Universitat Politècnica de Catalunya. <https://doi.org/10.5821/siu.6972>

González González, L. E., Baeriswyl Rada, S., y Zazo Moratalla, A. Z. (2020). Urban flood resilience in Chile: San Fernando and Los Ángeles experiences. *Revista de Urbanismo*, (43), 131-150. <https://doi.org/10.5354/0717-5051.2020.57868>

González-Mathiesen, C., March, A., y Yunis-Richter, F. (2023). Integrando la gestión del riesgo de los incendios forestales y la planificación territorial. *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres [REDER]*, 8(2), 68-82. <https://doi.org/10.55467/reder.v8i2.158>

Inzulza Contardo, J., Curihuinca Curihuinca, M., Easton Vargas, G., y Pérez Tello, S. (2022). Revelando el riesgo sísmico en el piedemonte de Santiago, Chile. Análisis multicriterio para la determinación de vulnerabilidad en la Falla San Ramón (FSR). *Revista de Geografía Norte Grande*, (81), 305-330. <https://revistanortegrande.uc.cl/index.php/RGNG/article/view/22431>

Jaque-Castillo, E., Ojeda-Leal, C., y Muñoz-Berrios, C. (2025). La interfaz urbano-forestal como tierra de nadie en la construcción del riesgo de incendio forestal en ciudades costeras chilenas. *Urbano*, 28(52), 52-63. <https://doi.org/10.22320/07183607.2025.28.52.04>

Leal Filho, W., Modesto, F., Nagy, G. J., Saroar, M., Yannicktoamukum, N., y Ha’apio, M. (2018, abril 1). Fostering coastal resilience to climate change vulnerability in Bangladesh, Brazil, Cameroon and Uruguay: a cross-country comparison. *Mitigation and Adaptation Strategies for Global Change*, 23, 579-602. <https://doi.org/10.1007/s11027-017-9750-3>

León, J., Winckler, P., Vicuña, M., Guzmán, S., y Larraguibel, C. (2023). Assessing the Role of Land-Use Planning in Near Future Climate-Driven Scenarios in Chilean Coastal Cities. *Sustainability (Switzerland)*, 15(4). 3718. <https://doi.org/10.3390/su15043718>

Rinaldi, A., y Bergamini, K. (2020). Inclusion of learning about management of natural disasters risk in territorial planning instruments (2005-2015). *Revista de Geografía Norte Grande*, (75), 103-130. <http://dx.doi.org/10.4067/S0718-34022020000100103>

Sandoval-Díaz, J., y Cuadra-Martínez, D. (2020). Vulnerabilidad social, severidad subjetiva y crecimiento postraumático en grupos afectados por un desastre climatológico. *Revista de Psicología*, 29(1), 1-15. <https://doi.org/10.5354/0719-0581.2020.58002>

Villagra Islas, P. A., y Felsenhardt Rosen, F. R. (2015). El paisaje urbano de emergencia en Valdivia, Chile: Contribuciones a la planificación y diseño urbano post-desastre para la restauración. *Revista INVI*, 30(83), 19-76. <https://dx.doi.org/10.4067/S0718-83582015000100002>



THE HISTORICAL CONSTRUCTION OF THE CENTRAL AREA OF LOS SALTOS DEL LAJA, CHILE: DUAL TOURIST LANDSCAPE ¹

LA CONSTRUCCIÓN HISTÓRICA DEL ÁREA CENTRAL DE LOS SALTOS DEL LAJA, CHILE:
UN PAISAJE TURÍSTICO DUAL

DANIELA GARCÍA- LETELIER ²
IGNACIO BISBAL-GRANDAL ³

¹ Artículo financiado por ANID – Beca Nacional Magíster año 2020

² Magíster en Patrimonio Arquitectónico y Urbano
Arquitecta
Universidad del Bío-Bío, Concepción, Chile
<https://orcid.org/0000-0002-6962-1521>
daniela.garcia1901@alumnos.ubiobio.cl

³ Doctor en Urbanismo
Director del Departamento Planificación y Desarrollo Urbano (DPDU),
Académico, Facultad de Arquitectura, Construcción y Diseño
Universidad del Bío-Bío, Concepción, Chile
<https://orcid.org/0000-0002-8304-2040>
ibisbal@ubiobio.cl

La investigación analiza la construcción del paisaje histórico del Área Central de Los Saltos del Laja (ACSL), desde su configuración bajo el modelo socioeconómico hacendal, consolidado en el siglo XIX, hasta convertirse en un paisaje turístico dinámico y complejo. El objetivo principal es comprender cronológicamente las diversas etapas y perspectivas que han dado forma al paisaje turístico actual de ACSL, mediante la identificación de los factores físicos y socioculturales que determinan sus transformaciones. Se utilizó un enfoque cualitativo y exploratorio, que combinó la revisión de fuentes secundarias —fotografías aéreas e históricas, cartografías y documentos bibliográficos— con entrevistas semiestructuradas a actores locales, lo que permitió el levantamiento de datos primarios y su análisis narrativo posterior. La integración de diversas fuentes mediante triangulación metodológica permitió contextualizar la transformación histórica del paisaje en el ACSL, a partir de la identificación de quiebres y tensiones, evidenciados en las interacciones de las dinámicas turísticas del sector, como elementos clave en la construcción del paisaje.

Palabras clave: paisaje, turismo, diseño del paisaje, paisaje cultural, desarrollo rural

This research analyzes the construction of the historical landscape of the Los Saltos del Laja Central Area (ACSL, in its Spanish acronym), from its configuration under the consolidated 19th-century hacienda or landowner socioeconomic model to its transformation into a dynamic and complex tourist landscape. The main objective is to understand, in chronological order, the stages and perspectives that have shaped the ACSL's current tourism landscape, and to identify the physical and sociocultural factors behind its transformation. A qualitative and exploratory approach was used, combining a review of secondary sources—such as aerial and historical photographs, cartography, and bibliographic documents—with semi-structured interviews with local stakeholders, permitting the collection of primary data and subsequent narrative analysis. The integration of different sources through methodological triangulation made it possible to contextualize the historical transformation of the landscape in the ACSL, identifying ruptures and tensions evident in the sector's tourism dynamics as key elements in the landscape's construction.

Keywords: landscape, tourism, landscape design, cultural landscape, rural development

I. INTRODUCTION

The study of landscapes in Chile and their relationship with tourism has been approached from various perspectives, including those focused on understanding how the landscape and its tourism use in Chile have been used as tools to build and promote a national identity (Canihuante, 2005; Booth, 2024) and others, which explore how iconographic representations in tourism publications, have shaped Chile's modern territorial imaginary (Galeano-Ibaceta, 2013; Booth & Lavín, 2013; Cortés et al., 2016). This last analysis is based mainly on the publications of the *Empresa de Ferrocarriles del Estado: Guía del Veraneante* (1932-1962) (State Railway Company: Vacationer's Guide (1932-1962)) and the magazine *En Viaje* (1933-1973). It examines how the promotion of tourist infrastructure in these magazines contributed to building the image of "southern" Chile as a tourist destination and to creating iconic sectors, such as "Chilean Switzerland" and other resorts in the country's southern region.

Addressing the historical construction of the tourist landscape in the ACSL, using an analysis focused on the ruptures and tensions as critical elements of its transformation, opens new perspectives to study the urbanization of the rural through tourism operations, which dialogue with contemporary research that analyzes how tourism dynamics, driven by global policies, environmentally and socially affect rural landscapes, transforming the surroundings and, with it, the daily routines and the quality of life of their inhabitants (Lariagon, 2021; Lariagon & Salinas Arreortua, 2025).

Saltos del Laja, or the Laja Waterfalls, located in the communes of Cabrero and Los Ángeles, in the Biobío region, constitute an outstanding natural and tourist site, whose development as a tourist landscape responds not only to natural factors, but also to a cultural process linked to public policies oriented, initially, to extending the nation state, through a dominant hacienda model that defined the landscape's use and exploitation, which generated social inequalities and segmentation in access to natural resources. This article examines how the interaction among institutional devices, private initiatives, and forms of community organization has shaped differentiated landscapes in the ACSL, which in turn have shaped the place's perceptions and tourist dynamics.

Information collection techniques included reviewing secondary sources for historical and descriptive analysis and conducting semi-structured interviews to obtain primary data, which were analyzed using a narrative approach. This made it possible to identify the physical and socio-cultural factors that have transformed the tourism landscape of Saltos del Laja.

II. THEORETICAL FRAMEWORK

The landscape: An unbreakable merger of nature and culture

The transition from the concept of landscape towards more encompassing approaches that recognize the inseparable relationship between nature and culture, which constitute a cultural construct whose meaning is reconfigured according to the historical, artistic, and social contexts in which it is inscribed (Maderuelo, 2007), understands landscape as a category in permanent resignification, shaped by diverse views that condition its interpretation and valuation over time.

From this perspective, the landscape is not only understood as a physical or visual space, but as the result of a continuous process of interaction between natural environments and human practices, something close to the concept of "naturculture", proposed by Donna Haraway, who approaches this inseparable relationship, arguing that nature and culture are not opposite categories, but processes that co-constitute each other (Araiza Díaz, 2021).

The landscape, understood as a dynamic social construct that, in turn, shapes the life and interactions of society (Lindón Villoria, 2007), implies that it not only arises from a harmonious relationship between nature and culture, but also is configured as a scene of dispute, the place of our social struggles, inequality and land exploitation (Carnevale in Rojas Valencia, 2020, p. 148). These disputes show the diversity of perceptions that fall on it, questioning traditional representations by making visible the power relations implicit in the historical construction of the landscape.

Tourism as a social phenomenon: Regional implications and transformations

Since its inception, tourism has been promoted as a driver of modernization and economic growth, especially in the Global South, for its ability to generate income and diversify economies. However, at the end of the 1950s, it began to be analyzed as an integrated social phenomenon (Mauss, 1971), as its influence across multiple dimensions of social and cultural life became evident, alongside criticisms of developmental approaches that ignored its negative effects in vulnerable contexts.

From this critical perspective, dependency theory questioned liberal approaches that promoted tourism as a motor of uniform development. In this context, the tourist enclave is consolidated as a model in which transnational capital exploits the natural and human resources of regions with high landscape value, by commodifying their landscapes and deepening asymmetric power relations and negative effects on the surroundings (Cordero, 2003; Franco, 2019, in Cantú Martínez, 2022, p.37)

Tourism, driven by the uniqueness of places, becomes a catalyst for the commodification of space. As Lariagon (2021) suggests, this phenomenon redefines landscapes and regions, transforming them into products for tourist consumption. Spaces previously linked to cultural practices, traditional uses, or ecological values are reorganized to maximize their potential as destinations, which generate tensions between economic development and the preservation of local values. In this sense, it is connected with what was proposed by Cohen (Benedí-Artigas et al., 2025, p.2), who interprets that the postmodern tourist, in a context of global homogenization, accepts the loss of authenticity and seeks a sophisticated cultural consumption that combines the familiar with the local, and that in turn increases their own cultural capital.

Tourist landscape: Approaches for its interpretation

The tourist landscape can be understood as a complex and dynamic socio-spatial construct, the result of interactions among the natural environment, cultural practices, and the economic logics of tourism. At the same time, it is shaped by the gaze of visitors and host communities, who, according to their own interests, stage the landscape (Bertoncello, 2009).

In this sense, the landscape becomes a symbolic commodity (Hernández Ramírez, 2006), selected, represented, and marketed within the tourism system. In this process of valorization, as Suden (2023) points out, certain exceptional attributes are promoted through tourist images, while other everyday aspects are ignored.

In this way, the tourist landscape selects elements that, due to their aesthetic or symbolic qualities, are attractive, often conditioned by power relations that regulate access, use, and how these landscapes are appropriated and lived (Cantú Martínez, 2022).

In line with this, Cordero's proposal (2003) offers an interpretative framework to analyze how global, national, and local dynamics affect the configuration of the tourist landscape, through three models: a) enclave, characterized by the predominance of transnational capital, the expropriation of local spaces and the hiring of unskilled labor; (b) local participation, where the offer of services managed by local actors and access to spaces of landscape value prevails; and c) combined, which combines elements of both.

III. CASE STUDY

The site of Los Saltos del Laja, located 37 km north of Los Angeles, is configured around four waterfalls that have given rise to a space recognized as an outstanding site for tourism

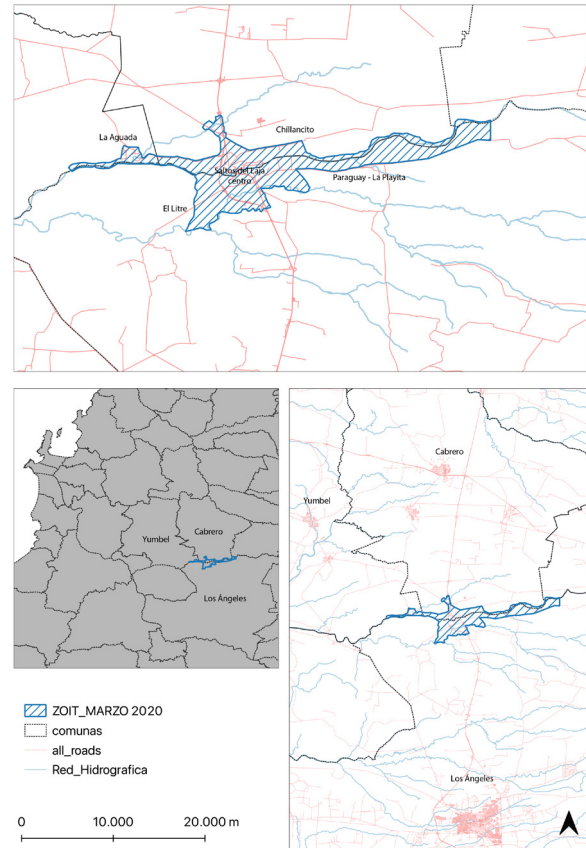


Figure 1. Location - Salto del Laja ZOIT. Source: Preparation by the Authors.

since the 1930s, consolidating itself as a "gateway" to the south of Chile thanks to its recognition in publications such as the *Guía del Veraneante* (Vacationer's Guide) and *En Viaje*. These initiatives marked the beginning of a tourist history deeply linked to the valuation of its natural landscapes as an emblematic tourist destination.

Its administrative boundaries have historically been complex. Before regionalization, the Laja River marked the natural border between the communes of Yumbel and Los Angeles. After the 1978 reform, part of the area came under Cabrero's jurisdiction, while a segment of the ACSL remained under Yumbel's jurisdiction. Currently, the territory is divided among three communes: Cabrero, Los Angeles, and Yumbel, a situation that led to the formation of the Association of Municipalities for Tourism Development (AMDT) in 2012 to provide an integrated approach to the destination's management.

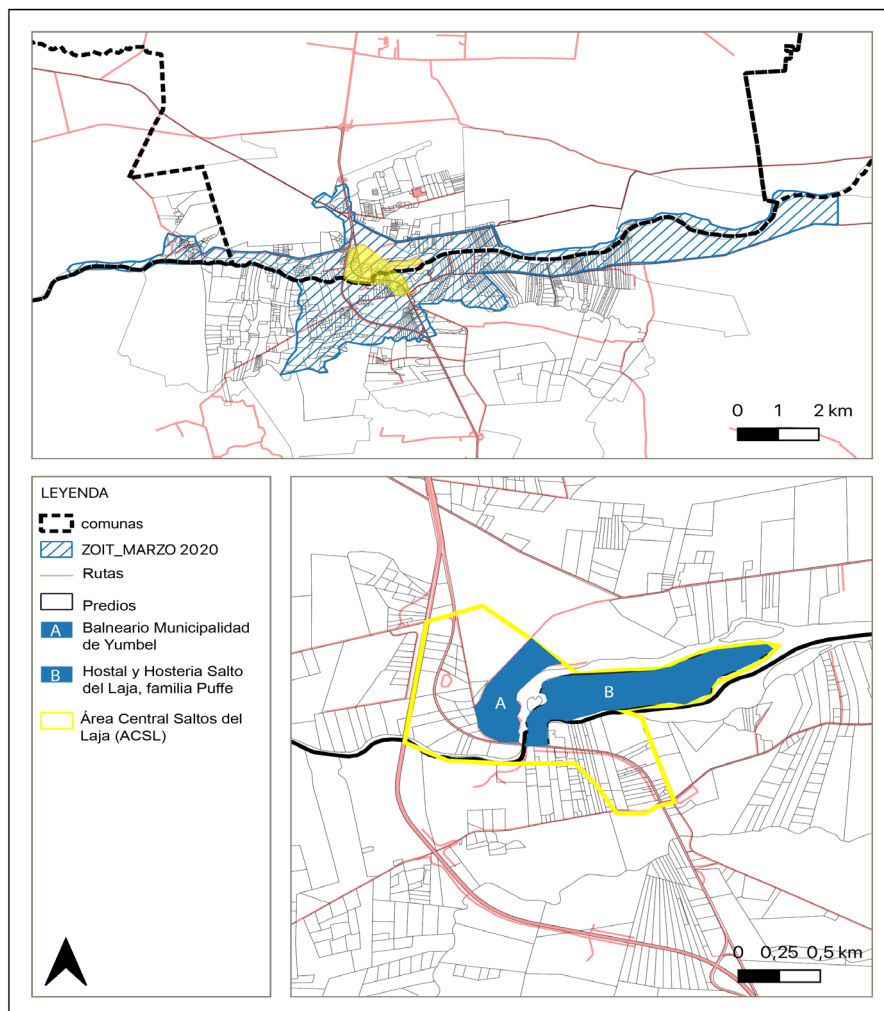


Figure 2. Location and characteristic elements of the ACSL. Source: Preparation by the Authors.

In this way, in 2015, the Zone of Tourist Interest (ZOIT, in Spanish) was established (Figure 1), which covers sectors such as Paraguay-La Playita, El Litre, Salto del Laja Centro, Chillancito, and La Aguada, with a population of 4,182 inhabitants (INE, 2017), within which the study polygon is located.

The study area of this research covers the ACSL (Figure 2), defined by three criteria: a) the location of the central waterfall, the main tourist attraction; b) the concentration of tourist services; and c) the history of the place and its first tourism-based businesses.

Within the polygon, two large, old properties stand out and have spurred tourism in the sector: on the north bank, the Municipal Resort of Yumbel, a former industrial branch of the old El Salto estate; on the south bank, the Salto del Laja Hotel, founded by the Puffe family in the 1950s.

IV. METHODOLOGY AND TECHNIQUES

The research has been conducted using a qualitative, exploratory approach, appropriate for little-studied phenomena such as the tourist landscape of Saltos del Laja (Denzin & Lincoln, 2018). A narrative approach is privileged, understood as a strategy that enables the understanding and re-signification of local actors' experiences in the tourism sector through their stories (Kohler Riessman, 2007).

To collect information, an exhaustive review of secondary sources contributing to the historical and descriptive analysis of the landscape was conducted, including aerial photographs, cartography, historical photographs, and bibliographic documents. On the other hand, semi-structured interviews were conducted

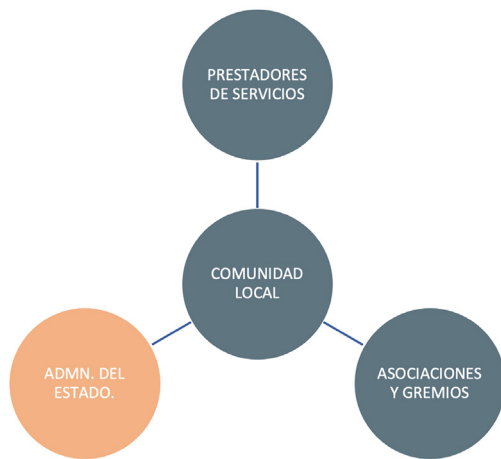


Figure 3. Interviewed stakeholders from the ACSL. Source: Prepared by the Authors based on the National Tourism Strategy 2030 (Undersecretary of Tourism, 2022).

with local actors (Figure 3), drawing on the guidance of Hernández-Sampieri and Mendoza Torres (2020), who discuss the usefulness of interviews for expanding perceptions and meanings.

To contrast the findings, methodological triangulation was applied (Hernández Sampieri et al., 2010), understood as the integration of diverse techniques and information sources to better, more broadly, and more nuancedly understand the dynamics that shape the tourist landscape in the ACSL.

Thus, considering that the landscape is understood as a social construct interpreted through narratives (Lindón Villoria, 2007) and configured as a scenario of dispute (Carnevale in Rojas Valencia, 2020, p. 148), the analysis was structured to identify ruptures and tensions as ACSL's landscape was being shaped. The ruptures allow recognizing transformations in its historical configuration, while the tensions reveal the disagreements and negotiations among stakeholders over the modes of use and appropriation of the landscape. These categories guide the reading of historical and cartographic sources and the stories of local actors, permitting an understanding of the socio-temporal aspects in the configuration of the ACSL's landscape.

V. RESULTS

Hacienda landscape: The transition to tourism development (before 1954)

Before its tourism development, Saltos del Laja was dominated by a consolidated hacienda model in the 19th century, with large estates such as El Salto, El Zarzal, Santa Rosa, and La

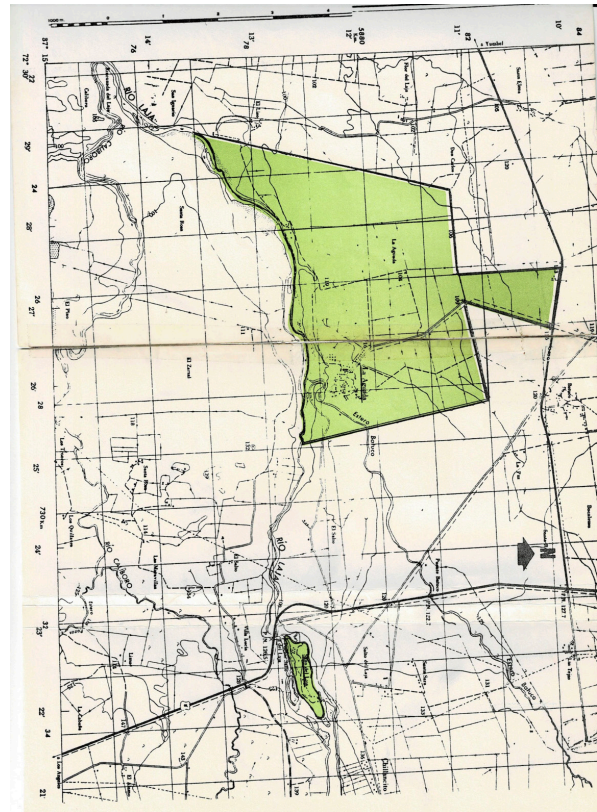


Figure 4. Location of Saltos del Laja, considering the large estates and the La Aguada Hacienda. Source: El Laja un río creador (Recart Novion et al., 1971).

Aguada (Figure 4), among others. These properties supported an economy based on agriculture and livestock. At the same time, at the margins, rural life was organized around subsistence farming, strengthened by community practices such as the *mingacos* (community projects) and *trillas* (threshing).

During this period, the landscape was mainly shaped by the productive infrastructure owned by large landowners, with the La Aguada hacienda standing out for combining agriculture, livestock, and industry, including mills, dairies, and irrigation systems that irrigated up to 900 blocks (Recart Novion et al., 1971).

In contrast, the inhabitants of the farms' interstices perceived the landscape as a sparsely inhabited space in which natural elements were an integral part of everyday life. The waterfalls, although amazing, were not seen as resources to be exploited, but as part of an affective relationship with the surroundings. Local commerce had a key role in everyday life, functioning as a space for supply and interaction.



Figure 5. View of the Old Bridge from the southwest bank, 1930s. Source: Puffe Family Archive.



Figure 6. Salto del Laja Hotel works sign, 1950s. Source: Puffe Family Archive.



Figure 7. View from the Salto del Laja Hostel's terrace, the 1950s. Source: Puffe Family Archive.

Tourism was not perceived as such by the inhabitants, since the visits were daytime and were led by travelers arriving by vehicle from the Yumbel train station. Despite the lack of tourist infrastructure, the State Railway Company (EFE) promoted the destination in its publications, which highlight the walks to the waterfall and the traditional photograph on the old bridge (Figure 5), iconic infrastructure of the ACSL at that time, and symbol of the transition between the farming past and the nascent tourist interest.

Elite tourist landscape: Saltos del Laja as a tourist development pole (1955-1986)

In the second half of the 20th century, Saltos del Laja went from a productive landscape based on the hacienda model to an incipient tourist landscape, driven by a tourism vision as an instrument of modernization. The construction of the Salto del Laja Hostel in the 1950s marked a milestone in this transformation, allowing visitors to extend their stays and helping consolidate the area as an emerging tourist destination and gateway to southern Chile (Figure 6).



Figure 8. View of the new and old bridge, ca. 1960s. Source: [Photo], Salto del Lajatur. www.saltodellajatur.cl.

Located on an island with privileged views of three of the four waterfalls, the resort was inspired by the American motel model. It integrated itself into the national tourist circuit thanks to its proximity to the Southern Pan-American Highway. Its design sought to harmonize with the natural environment by adopting a reduced scale and following principles of the Japanese garden, where contemplation and water were central elements (Figure 7).

The infrastructure promoted by the Puffe family, oriented toward elite tourism, was reinforced by the construction of the new bridge over the Laja River, which facilitated access and spurred new regional dynamics that benefited tourism development (Figure 8).

During this period, the agrarian reform accelerated the decline of the hacienda model by expropriating factories and estates, such as the La Aguada Hacienda, reconfiguring land ownership in the area. A key milestone was the 1968 expropriation of 19 hectares of the El Salto Estate for a working-class resort (Law 17,059 of 1969), which is now known as Yumbel Municipal Resort.

The reconfiguration of land ownership was reflected in the establishment of the first tourist enterprises in the ACSL, such as the first campsite, located in front of the Salto del Laja Hotel, which is now the Los Manantiales tourist complex. This property, located on the banks of the river, was acquired in 1986 by Gastón Rodríguez, a native of Los Saltos, marking the beginning of a new stage in the territory's occupation and tourism.

Harmonious tourist landscape: Heyday of tourism development in Saltos del Laja (1986-2000)

With the arrival of the bus, the train was gradually displaced as a means of mass transport. Saltos del Laja began to be consolidated as a popular tourist destination, attracting new visitors from nearby cities, which, together with the arrival of street traders and the sale of local products, such as tortillas and jerky on the bridge (Figure 9), fostered new economic dynamics and consolidated traditions still present in the ACSL landscape.



Figure 9. Donoso Family Jerky Makers, 1980s. Source: Donoso Family Archive.

Thus, at the end of the 1980s, the opening to a popular tourism imprint gave way to the proliferation of campsites in sectors around the ACSL, such as Paraguay and La Playita, which were driven by local inhabitants, who saw in tourist services an alternative for their family's livelihood and a new economic relationship with the landscape.

At the end of the 1980's, the first actions by the public administration aimed at managing the area with a tourist approach were defined in the Salto del Laja Sectional Plan (Resolution 1 of 1990), which proposes intercommunal planning for the ACSL polygon. Some of the interviewed actors recognize this period as the heyday of tourism development in Los Saltos, due to the "harmonious" coexistence among inhabitants, street traders, artisans, and the Puffe family, who operated their tourist enclave. To this, the private concessions that the Municipality of Yumbel granted in the 1990s for its resort were added, which are positively recognized for their management, evidenced by the creation of new infrastructure and the establishment of regulated commercial areas.

Dual tourist landscape: The massification of tourism in Saltos del Laja (since 2000)

The construction of the Route 5 south bypass was a turning point in the expansion of tourism in Saltos del Laja. Although at first the inhabitants perceived its construction as a threat by disconnecting the ACSL from the main route to southern Chile, over time this decision was valued as an environmental improvement that strengthened tourism. At the same time, the municipal administrations of Yumbel and Cabrero promoted the expansion of fairs within the municipal resort through clientelist practices and political favors, which generated the first disputes over the projected tourist image of the place (Figure 10).

Since the 2000s, tourism promotion policies by the National Tourism Service, SERNATUR, and the ZOIT declaration have consolidated the destination, attracting small-scale private investment. However, the exclusive incorporation of formalized actors into the participation widened the gap



Figure 10. Access to the main waterfall. Yumbel Municipal Resort, 2023. Source: Personal archive of the Authors.



Figure 11. View from a Salto del Laja Hotel bedroom. Source: [Photo], Hotel Salto del Laja. <http://www.hotelsaltodellaja.cl>

with the informal sectors, which support a large part of the ACSL economic circuit. These dynamics, combined with the administrative complexity arising from the convergence of three communes, reflect the structural tensions that shape the current tourist landscape of the ACSL, as evidenced by the two largest properties it comprises.

On the south bank, the expropriated land, owned by the Municipality of Yumbel (Law 17059 of 1969), is characterized by architecture associated with the self-construction of initially ephemeral premises that, over time, have acquired a permanent character, promoting an offer of fast food and crafts. These structures, arranged in a linear pattern parallel to the riverbed and oriented towards the main waterfall, form the resort's main route. They propose a single route to the visitor, conditioned by a logic of consumption that restricts the spaces intended for the enjoyment and contemplation of the natural landscape.

On the other hand, on the north bank, the Puffe family's tourist offer responds to global models through its privileged space, which gives it an isolated location. The "Salto del Laja Hotel" complex preserves a hermetic management model, with controlled access and a leisure-based architectural program, organized from a closed circuit that structures the tourist experience (Figure 11). The vegetation accompanies the pedestrian path, which connects open spaces for golf and exotic animal breeding and provides access to three of the four waterfalls that make up the Saltos del Laja.

VI. DISCUSSION

The tourist landscape of the ACSL has been configured as a dynamic, relational process, punctuated by successive ruptures linked to the infrastructures of mobility and tourist equipment, which have redefined how the landscape is currently inhabited and what it means (Booth, 2024). The railway, the bridges over the Laja River, and the bypass of Route 5 South generated different forms of landscape appropriation, which evidence tensions among modernization, access, and inequality.

In the mid-20th century, the landscape of the ACSL began to be reinterpreted from the perspective of the traveler and the logic of leisure, transforming its rural base and resignifying it as a tourist resource. The infrastructure promoted by the Puffe family consolidated a tourism model associated with the automobile and a public with greater purchasing power, which expresses the neoliberal rationality that commodifies the experience of the landscape (Cantú Martínez, 2022).

Towards the end of the 1980s, the massification of bus travel and the creation of a popular resort expanded access to tourism by popularizing the landscape and diversifying its uses. The subsequent construction of the bypass marked a new rupture, requiring state mediation that made visible the inequalities between formalized actors and informal traders, reproducing the structural tensions of the landscape.

From the reading of Benedí-Artigas et al. (2025), based on the theory of postmodern tourism, the ACSL can be understood as a landscape straddling between the elitist and the popular, where nature and local memory have become commodified resources. However, unlike in urban processes, in Los Saltos del Laja, the resignification of the landscape arises from working-class sectors that, in a peri-urban context devoid of recreational spaces, have claimed the place as their resort and as a site of collective belonging.

These processes, traversed by power relations, symbolic disputes, and socioeconomic dynamics that, read from the typologies of tourism development by Cordero (2003), allow analyzing the coexistence of two models of tourism development: The Salto del Laja Hotel with an elitist tourism associated with modernization and private capital representative of an enclave oriented to the global market; and the Yumbel Municipal estate, as popular tourism, which responds to a local participation model, with an offer accessible to a wider public associated with a public space of great natural and scenic value.

VII. CONCLUSIONS

The analysis shows the existence of two cultural landscapes, built independently of each other, based on the interaction of a multiplicity of actors with often-conflicting interests. From this interaction, structural tensions arise that persist today: formality and informality, conservation and consumption.

Based on Cordero's approach, this duality can be understood as the expression of a mixed tourism model in which the logic of the global enclave is intertwined with local participation practices. More than a closed dichotomy, the ACSL represents a space in constant negotiation, where class differences, cultural capitals, and historical trajectories are inscribed in the landscape as material and symbolic traces. This mixed condition not only evidences the persistence of inequalities but also the forms of local

agency, expressed in trades, practices, and memories that articulate a shared identity around the river, the craft fair, and the ancient ways of inhabiting the landscape.

In this sense, the ACSL is presented as an opportunity to understand the intersections between tourism, landscape, and social class in Chile. Its study makes visible how tourism modernization, while opening up opportunities, reproduces hierarchies and exclusions. Faced with this, enhancing tourist landscapes requires policies that integrate cultural and natural heritage as inseparable components and promote development based on local identity and community management.

VIII. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, D.G., I.B.; Data curation, D.G., I.B.; Formal analysis, D.G., I.B.; Acquisition of financing, D.G.; Research, D.G.; Methodology, D.G., I.B.; Project management; Resources, D.G.; Software; Supervision, I.B.; Validation, D.G., I.B.; Visualization; Writing - original draft, D.G.; Writing - revision and editing, D.G.

IX. BIBLIOGRAPHIC REFERENCES

Araiza Díaz, V. (2021). Reinventar la naturaleza para hacernos cargo del Capitaloceno: la propuesta de Donna Haraway. *Andamios*, 18(46), 413-441. <https://doi.org/10.29092/uacm.v18i46.851>

Benedí-Artigas, J., Sanagustín-Fons, V., & Moseñe-Fierro, J. A. (2025). Tourism gentrification and the resignification of cultural heritage in postmodern urban spaces in Latin America. *Societies*, 15(7), 184. <https://doi.org/10.3390/soc15070184>

Bertoncello, R. (2009). Turismo y patrimonio, entre la cultura y el negocio en M. T. Duarte Paes y M. Ramos da Silva Oliveira (Eds.), *Geografía, turismo e Patrimônio cultural* (pp. 151-168). Annablume-FAPESP.

Booth, R. (2024). El paisaje del ferrocarril en la colonización de la Araucanía. Narrativa y fotografía en torno a Gustave Verniory (1889-1899). *Revista de Historia*, (31), 1-42. <https://doi.org/10.29393/RH31-29PFRB10029>

Booth, R., & Lavín, C. (2013). Un hotel para contener el sur. *ARQ*, (83), 56-61. <https://doi.org/10.4067/S0717-69962013000100009>

Cantú Martínez, P. C. (2022). Secuelas de la mercantilización de la naturaleza por el turismo. *Economía & sociedad*, 27(62), 1-14. <https://www.scielo.sa.cr/pdf/ays/v27n62/2215-3403-ays-27-62-31.pdf>

Canihuante, G. (2005). Paisaje y turismo en la formación de la identidad de Chile. *Aportes y Transferencias*, 1(009), 75-92. <https://www.redalyc.org/pdf/276/27690105.pdf>

Cordero, A. (2003). El turismo y la dependencia Latinoamericana. *Anuario Social y Político de América Latina y el Caribe*, (6), 104-111. <https://www.calameo.com/read/002567856caa703669c02>

Cortés, M. M., Vergara, L. M., & Puig A. (2016). Chile como destino turístico. Las publicaciones periódicas de Ferrocarriles del Estado: 1933-1973.

Arquitecturas del Sur 34(50), 18-29. <https://doi.org/10.22320/07196466.2016.34.050.03>

Denzin, N. K., & Lincoln, Y. S. (2018). *The Sage handbook of qualitative research* (5th ed.). Thousand Oaks, CA: Sage.

Galeano-Ibaceta, C. (2013). Turismo y arquitectura moderna en el reconocimiento de los territorios desérticos del norte de Chile: El Consorcio Hotelero Nacional y Honsa. *Arquitecturas del sur*, 31(44), 92-106. <https://revistas.ubiobio.cl/index.php/AS/article/view/759/720>

Hernández Ramírez, J. (2006). Producción de singularidades y mercado global. El estudio antropológico del turismo. *Boletín Antropológico*, 24(66), 21-50. <https://hdl.handle.net/20.500.14330/CLA01000267239>

Hernández-Sampieri, R., & Mendoza Torres, C. P. (2020). *Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta*. McGRAW-HILL Education.

Hernández Sampieri, R., Fernández Collado, C., & Baptista Lucio, M. P. (2010). Metodología de la investigación (5ª ed.). McGraw-Hill / Interamericana Editores, S.A. <https://www.smujerescoahuila.gob.mx/wp-content/uploads/2020/05/sampieri.met.inv.pdf>

Instituto Nacional de Estadísticas [INE]. (2017). Censo de población y vivienda 2017: Resultados definitivos. <https://www.censo2017.cl>

Kohler Riessman, C. K. (2007). *Narrative methods for the human sciences*. Sage Publications.

Lariagon, R. (2021). Turismo y dinámicas espaciales diferenciales de urbanización: reflexión a partir de ejemplos mexicanos. en L. Fernández (Ed.), *Henri Lefebvre. Evento Internacional- Montevideo, Uruguay, Mayo de 2021*. Graáfica Mosca. https://lep-ufpe.com.br/laboratorio-espaco-e-politica/arquivos/2021_Livro_Henri%20Lefebvre%202021_digital.pdf

Lariagon, R., & Salinas Arreortua, L.A. (2025). Turismo rural en la metropolización. Reflexiones teórico-metodológica a partir del caso de Oaxaca, México. *Revista INVI*, 40(113), 142-171 <https://doi.org/10.5354/0718-8358.2025.74001>

Ley 17059 de 1969. Autoriza a la Municipalidad de Yumbel para expropiar los lotes de terrenos que señala. 14 de enero de 1969. Diario Oficial de la República de Chile. <https://bcn.cl/xair75>

Lindón Villoria, A. (2007). La construcción social de los paisajes invisibles del miedo en J. Nogué (Ed.), *La construcción social del paisaje* (2 ed., pp. 217-240). Biblioteca Nueva.

Maderuelo, J. (2007). *El paisaje. Génesis de un concepto*. Abada Editores.

Mauss, M. (1971). *Sociología y Antropología. Colección de Ciencias Sociales Serie de Sociología*. Editorial Tecnos. https://monoskop.org/images/b/b4/Mauss_Marcel_Sociologia_y_antropologia.pdf

Resolución 1 de 1990. Aprueba Plan Seccional Salto del Laja. Ministerio de Vivienda y Urbanismo] Secretaría Regional Ministerial VIII Región Del Biobío. 29 de marzo de 1990. <https://bcn.cl/QctjTV>

Rojas Valencia, P. A. (2020). Variaciones del paisaje: arqueología del paisaje en la creación artística. *Cuadernos de Música, Artes Visuales y Artes Escénicas*, 15(1), 126-157. <https://doi.org/10.11144/javeriana.mavae15-1.vpap>

Subsecretaría de Turismo. (2022). *Estrategia Nacional de Turismo 2030. Gobierno de Chile*. <https://www.subturismo.gob.cl/wp-content/uploads/2022/03/Estrategia-Nacional-de-Turismo-2030.pdf>

Suden, C. (2023). Aproximación a los procesos de valorización patrimonial y turística de los paisajes del oasis norte de Mendoza: Una propuesta de

periodización desde la geografía. *Estudios Geográficos*, 84(294), e127. <https://doi.org/10.3989/estgeogr.2023133.133>

Recart Novión, A., Keller, R. C., & Sievers, H. K. (1971). *El Laja: un río creador*. Ediciones Jerónimo de Vivar, Cooperativa de Ediciones.

X. ACKNOWLEDGEMENT

ANID, National Master's Scholarship.

SUSTAINABLE URBAN MOBILITY AND LANDSCAPE CONSERVATION: THE CASE OF BELLA DURMIENTE HILL IN LIMA, PERU ¹

MOVILIDAD URBANA SOSTENIBLE Y CONSERVACIÓN PAISAJÍSTICA: EL CASO DE LA
LOMA LA BELLA DURMIENTE EN LIMA, PERÚ

DALITH LIZETH QUISPE-TORRE ¹
OSCAR FREDY CERVANTES-VELIZ ²
IGOR VILLARES-DE-CARVALHO ³
ANALUCIA RIVEROS-CAYTUIRO ⁴

- ¹ Magíster en Ciencias en Regeneración Urbana
Docente, Facultad de Arquitectura, Urbanismo y Artes
Universidad Nacional de Ingeniería, Lima, Perú
<https://orcid.org/0000-0002-4438-8516>
dquispet@uni.edu.pe
- ² Doctor en Arquitectura y Administración
Docente, Facultad de Arquitectura, Urbanismo y Artes
Universidad Nacional de Ingeniería, Lima, Perú
<https://orcid.org/0000-0001-8872-8861>
ocervantes@uni.edu.pe
- ³ Magíster en Arquitectura
Docente, Escuela de Comunicación y Tecnología
Universidade Católica de Pernambuco, Recife, Brasil
<https://orcid.org/0000-0002-5865-6542>
igor.villares@unicap.br
- ⁴ Magíster en Regeneración Urbana
Candidata a doctora en Antropología, Facultad de Ciencias Sociales
Universidad Nacional Mayor de San Marcos, Lima, Perú
<https://orcid.org/0009-0000-4786-6125>
analucia.riveros@unmsm.edu.pe

<https://doi.org/10.22320/07183607.2026.29.53.02>



Las áreas paisajísticas de Lima se encuentran en peligro de desaparición debido a la expansión de la ciudad. Dentro de estas áreas se ubican las lomas costeras, que crecen en diversos distritos de la ciudad debido a la neblina. Uno de esos distritos es Independencia, en Lima Norte, en donde se hallan diversas lomas, y una de estas es la Loma Bella Durmiente, que en parte de su extensión conserva su belleza paisajística y biodiversidad, y aún no es invadida. Por ello, el artículo analiza las estrategias de movilidad urbana para la conservación de la loma. La metodología utilizada se basa en la observación participante y en el método cartográfico para recopilar información in situ y procesarla en el gabinete. Entre los principales resultados, relacionados con la movilidad urbana, se destaca la existencia de distintas escalas de acceso a la loma, la metropolitana, la distrital y la barrial, condicionadas por la geografía del distrito. Asimismo, se identificaron iniciativas de protección de la loma impulsadas por los vecinos de los barrios en ladera. Sin embargo, se ha evidenciado una falta de planificación que considere estas particularidades para hacer el recorrido más amigable y atractivo.

Palabras clave: conservación de áreas paisajísticas, lomas, movilidad urbana sostenible

Lima's landscaped areas are in danger of disappearing due to the city's expansion. These areas include coastal hills, whose vegetation emerges in various districts of the city due to the fog. One such district is Independencia, in North Lima, where several hills are located, including Loma Bella Durmiente or Bella Dumiente Hill, which retains its scenic beauty and biodiversity in part of its still-uninvaded area. This article looks to analyze urban mobility strategies for hill conservation. The methodology is based on participant observation and cartographic methods for collecting information in the field and processing it in the office. Among the main results regarding urban mobility is the existence of different access scales to the hill: metropolitan, district, and neighborhood, determined by the district's geography. Hill protection initiatives led by residents of the hillside neighborhoods were also identified. However, a lack of planning was evident, as these aspects were not considered to make the route user-friendly and more attractive.

Keywords: landscape conservation, hills, sustainable urban mobility

I. INTRODUCTION

Lima's hills are unique ecosystems in the arid regions of the Peruvian coast (Figure 1), characterized by high biodiversity driven by seasonal fog. This ecosystem faces threats due to uncontrolled urban expansion and pollution. These factors affect biodiversity and the role the hills play as green spaces that mitigate climate change and conserve water resources. (Nieuwland & Mamani, 2017). The State institutions have rules that regulate land use and protect green areas. However, these are insufficient to include these areas within the city, where land demand is very high (García et al., 2014), or to incorporate initiatives from adjoining neighborhoods that work on local alternatives directly connected to these spaces. Therefore, it is essential to analyze the condition of urban hills at metropolitan and local scales to demonstrate how they actually connect with the urban fabric. In this sense, a little-explored aspect is the role of sustainable urban mobility in conserving these landscapes.

Among the districts with hills is Independencia, home to Sleeping Beauty Hill or *La Loma La Bella Durmiente*, a self-managed ecotourism area shaped like a sleeping woman. Currently, this area is managed by residents of the surrounding neighborhoods, with some support from the State for the dissemination, promotion, and technical support of non-governmental organizations. Independencia also has a varied transport infrastructure, such as the Metropolitan bus network and private company buses on Av. Tupac Amaru and Panamericana Norte. The incorporation of Lima Metro's line 3 is also planned. According to the Transport Oriented Development theory (Rodríguez, 2021), these conditions should encourage the formation of areas around public transport stations that are well connected to the rest of the city. Within this framework, the hill should be included within these areas to guarantee its urban integration and promote its use and conservation.

Sustainable urban mobility directly influences the conservation of urban landscape areas, as in the case of Lima's hills. The conditions of accessibility to these areas are decisive in making them attractive spaces for the general public, so that they can be integrated into citizens' routines and collective memory. The connection between the nearby mass transit stations and the scenic area requires strategies that consider the development of both metropolitan and local uses. These local strategies should consider the physical articulation and integration of the population of neighboring neighborhoods, who play a key role in the co-management, maintenance, and protection of these areas.

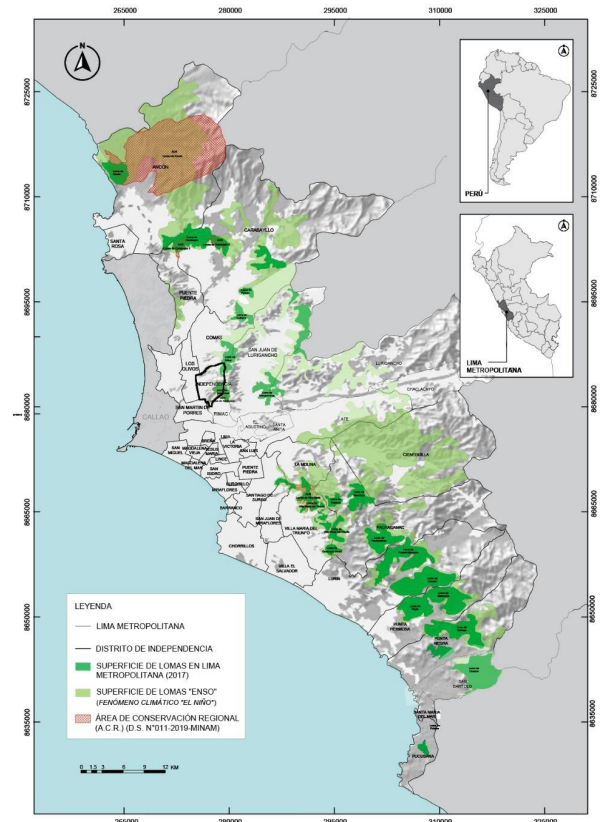


Figure 1. Lima's Hills - representative ecosystems of the city. Source: Ministry of the Environment (MINAM) and National Environmental Information System (SINIA) (2021).

In this context, this article aims to analyze urban mobility strategies to preserve the landscape of Bella Durmiente Hill. To do this, 3 specific objectives are proposed: 1) To analyze the accessibility conditions towards the Hill from a metropolitan and local perspective, 2) To examine the types of spaces and uses that accompany the route to the Hill from the nearest mass transit stations, and 3) To identify local initiatives aimed at the conservation of the Hill's landscape area.

II. THEORETICAL FRAMEWORK

An attempt has been made for more than a century, to incorporate the concept of a city with green areas into the world (Taylor, 2025), since these areas mitigate air pollution, regulate heat and noise; regulate the climate, conserve biodiversity, provide key ecosystem services, and provide opportunities for physical activity and social interaction (Rasidi et al., 2018), which has an impact on physical, mental health and social well-being. (Nieuwenhuijsen et al., 2022).

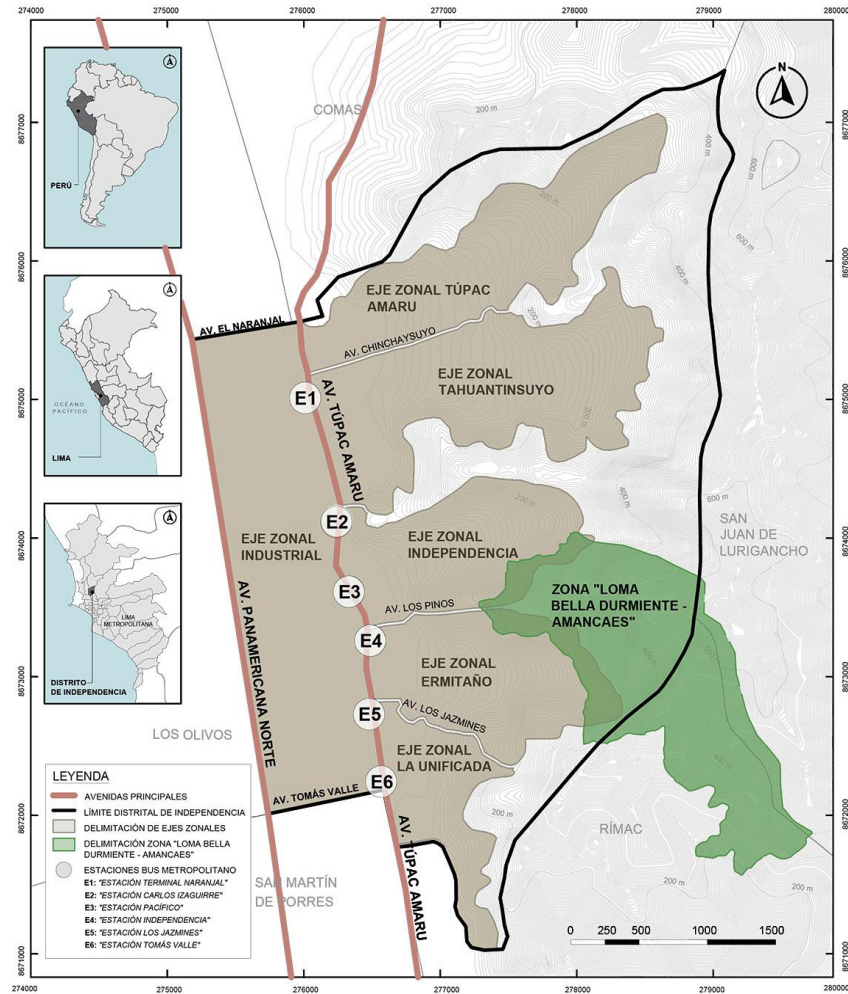


Figure 2. Independencia, the lower slope (industrial area), and hillside neighborhoods (other areas). The Hill, Tupac Amaru Ave., Panamericana Ave., and the Metropolitan stations (TOD nodes). Source: Preparation by the authors based on the land registry plan.

According to the biophilia theory, humans need to be in harmony with the natural environment to generate physical and psychological benefits (Orellana-Alvear et al., 2017), since an affective connection with nature is formed through sensory and cognitive experiences. Ecological patterns evoke security and belonging. In the urban context, these principles make it possible to understand green areas as essential spaces for health, resilience, and the construction of sustainable socio-ecological links.

However, there are problems in their management and implementation (Zuniga-Teran et al., 2021). Urban plans often fail to incorporate dimensions of access to green spaces across urban scales, limiting their effectiveness as ecological and social infrastructure (Nguyen et al., 2021). Hence, public policies must combine environmental justice, ecological

planning, and participatory governance (Hanna & Comín, 2021; Abramo, 2007). Similarly, several authors consider that participation, appropriation, and/or use are necessary for the conservation of green areas (Jacobs, 1961; Seisdedos, 2007).

Despite the ecological and social value of urban ecosystems, few studies link sustainable urban mobility to the conservation of landscape areas, particularly from a multi-scalar perspective (Vilanova et al., 2024). Urban mobility is a central concept in building sustainable cities and improving citizens' quality of life. Its study allows evaluating how transport policies can serve as a basis for efficient and environmentally friendly urban development (Tanikawa-Obregón & Paz-Gómez, 2022). Sustainable urban mobility promotes the use of public transport, bicycles, and walking (Álvarez Vanegas, 2020). Currently, there are several plans and initiatives in Lima aimed

at improving the city's mobility to make it more sustainable, but they are insufficient or have not yet been implemented. (Vega Centeno et al., 2022). On the other hand, the peripheral districts of Lima, such as Independencia, face physical (slopes, distances) and social (insecurity) obstacles that hinder the use of active modes of transport, such as walking or cycling. Despite this, residents generate local displacement dynamics to solve everyday issues (Robert & Pereyra, 2024). This situation directly affects travel times, accessibility, and residents' daily mobility experience (Ponce et al., 2022).

In that sense, the Transport-Oriented Development (TOD) model offers a useful framework for addressing the relationship between mobility and landscape. This approach promotes sustainable urban development by integrating public transport, density, compactness, multimodality, and mixed uses in a nearby area that is easily walkable and cyclable (Rodríguez, 2021). In the case of Independencia, a significant change is evident following the implementation of the metropolitan bus system and the incorporation of metropolitan-scale uses, indicating that the TOD approach should be considered to better plan the district (Figure 2). In metropolitan contexts with nearby ecosystems, TOD takes on an ecological dimension by channeling urban flows and reducing pressure on natural landscapes. By promoting sustainable transport corridors, it helps minimize local fragmentation, strengthen ecological edges, and align urban accessibility with landscape conservation, thereby integrating urban planning objectives, efficient mobility, and environmental resilience.

III. CASE STUDY

La Loma Bella Durmiente

The La Bella Durmiente Hill is located in the district of Independencia, north of Lima. The hill is a fragile, intangible ecosystem of heritage interest and landscape protection, characterized by its biodiversity, natural landscape, cultural importance, and role in environmental regulation (Nieuwland & Mamani, 2017; Sánchez, 2022), and it is part of the Lomas de Amancaes and the Lomas de Lima System. The hills represent one of the few natural spaces still preserved in the district, but they are at risk of disappearing due to urban expansion (Reaño Torres, 2022).

IV. METHODOLOGY

The work was carried out onsite and in the office, where the general and specific literature on sustainable urban mobility and TOD was reviewed. To address the three

objectives, the participant observation mechanism and analysis of printed plans were used in the field, employing the cartographic method to cover routes near the hill and develop urban layouts that facilitate understanding the current urban mobility dynamics along these routes (Figure 3). The information was then processed in the office using the accessibility, uses, spaces, and neighborhood participation variables.

To address the first and second objectives, four metropolitan bus stations were used as TOD nodes, starting from their bus stops: Naranjal, Pacífico, Independencia, and Tomás Valle (Figures 4 and 5), following the routes that visitors publish on social networks. Printed land registry plans obtained from State webpages were used to survey uses. Photos and videos of the routes from the four metropolitan transport stations to the hill were taken to identify uses, types of spaces, and forms of accessibility (means of transport and road conditions). The Moovit application was then used to identify transport lines in the district, and the Adidas Runtastic application was used to estimate distances. To review the third objective, eight face-to-face interviews, organized thematically (activities, care, and management), were conducted onsite with residents from hillside neighborhoods, while public social media content about the hill was reviewed in the office. With all this information, strategies promoting sustainable urban mobility for the hill's conservation were analyzed.

V. RESULTS

Accessibility to the Hill at a metropolitan and local level

The hill stands out in North Lima because it has 6 stations on the metropolitan bus system (Figure 4) and is within 2.5 km of the bus stops of more than 20 private bus lines. This makes the hill accessible at the metropolitan level to local residents and to residents of neighboring and distant districts. However, it appears that the State has not established mechanisms to connect the hill to the bus stations. In their absence, Independencia's resident population has created local mechanisms that link stations to the Hill through micro-mobility and pedestrian movement.

Access to the hill is multimodal due to the blocks' morphology and the district's topography. Near the initial bus stops, people move around on public buses, private buses, vans, cars, motorcycle taxis, and on foot. In the intermediate hillside neighborhoods, people use vans, cars, motorcycle taxis, and walk. In the neighborhoods on the upper slopes, people get around on motorcycle taxis and on foot. The hill, however, can only be accessed on foot. This means that two or three modes of transport must be used. It should be noted that transportation within the neighborhoods on the slopes is provided by neighbors in the same district.

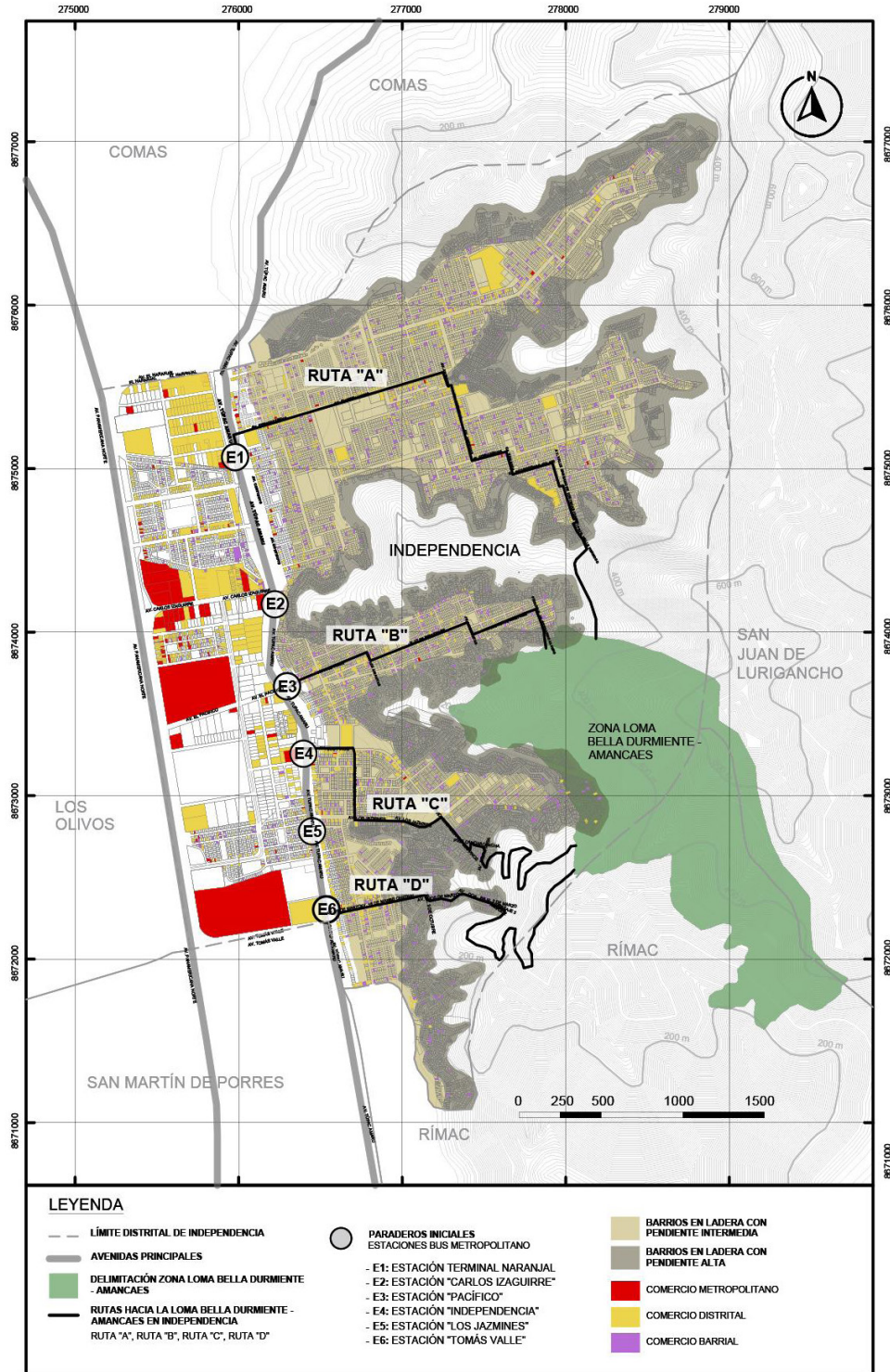
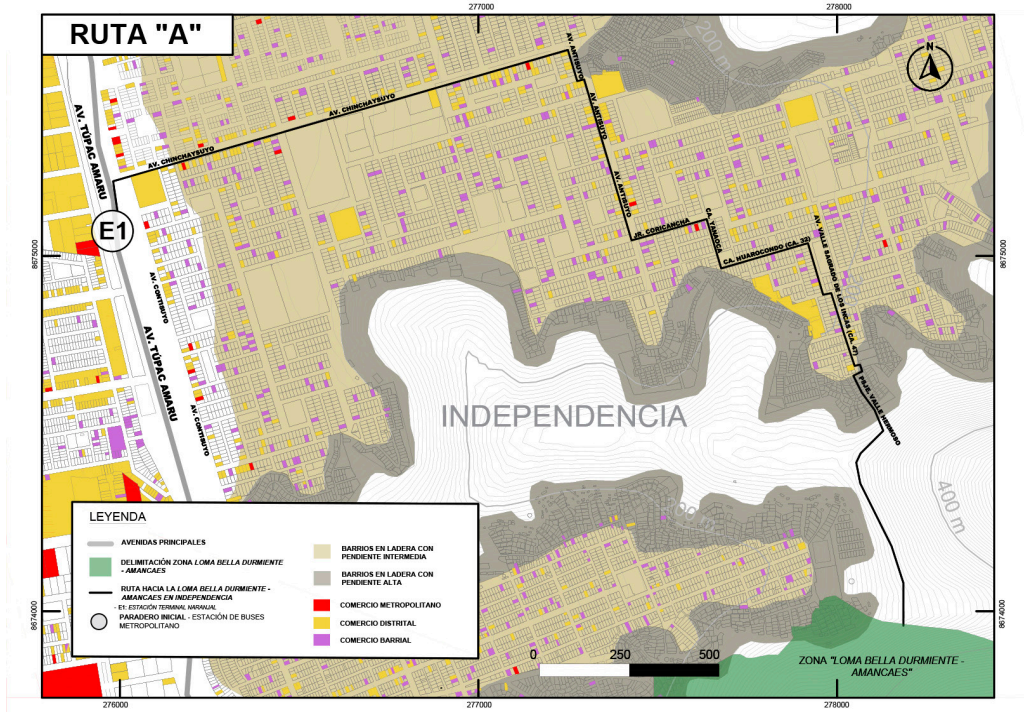
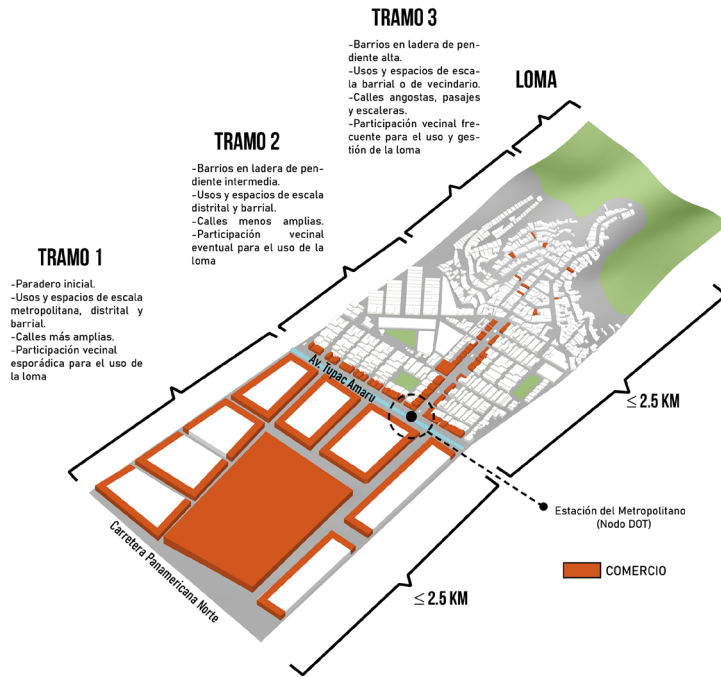


Figure 3. Routes to the hill from the Metropolitan stations (TOD nodes). Spaces and variable uses until one reaches the hill. Source: Preparation by the authors based on the land registry plan.



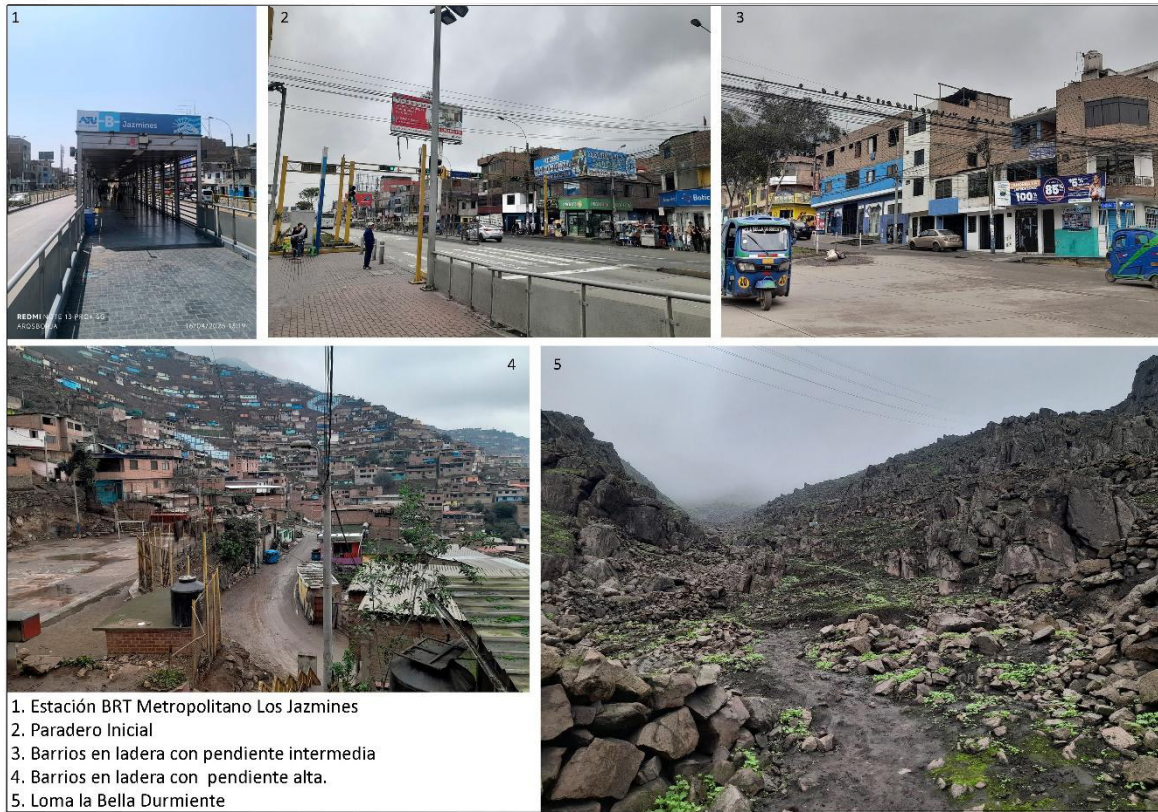


Figure 6. Sectors from the initial bus stops to the hill. Source: Images of the authors.

At the metropolitan level, accessibility is primarily along Túpac Amaru Ave. and the Panamericana Norte. On Tupac Amaru Ave., the metropolitan bus stations are potential TOD nodes. However, they function only as transport terminals, lacking direct connections to nearby urban spaces, such as urban landscape areas. This evidences a strategic opportunity to link mass transport with urban green infrastructure.

At the local level, there are three sections on the route between the Metropolitan and the hill's stations (Figure 6). The neighborhoods on an intermediate slope are more consolidated, with narrow sidewalks, unsafe pedestrian crossings, and no bike paths. The neighborhoods on the upper slopes are less consolidated, with no hierarchical design that facilitates movement towards the hill. Finally, the hill has informal paths, with steep slopes and a lack of signage or street furniture. This situation outlines an opportunity to improve local access to the hill, considering the existing dynamics (Table 1).

Although the metropolitan infrastructure offers highly accessible nodes, the lack of a modal hierarchy and suitable

urban transitions prevents the consolidation of a sustainable circuit.

Spaces and uses on the route to the hill

The routes from the metro stations to the hill exhibit a differentiated spatial and functional slopes that run among a consolidated urban fabric, an urban fabric to be consolidated, and a natural edge ecosystem. These circuits show how the spaces and their uses directly influence the mobility experience and the potential to connect mass transport, micro-mobility, and the landscape.

The sequences of space and uses within the circuits take into account the neighborhoods' morphology and the district's topography. In the initial bus stops, there are consolidated neighborhoods, with metropolitan, zonal, and neighborhood trade. The roads are wide and have sidewalks, bike paths, and even gardens. The width of the streets is at the neighborhood or district scale. In neighborhoods on an intermediate slope, there is less consolidation, and neighborhood trade consists primarily of convenience stores. The roads are wide but

Theories	Findings	Relationship with the theoretical framework	Implications for conservation
Biophilia	Neighborhood participation for the management, use, and upkeep of the hill	Confirms the need for sensory and affective connection with nature	Community ownership strengthens landscape management and its symbolic value.
Sustainable urban mobility	Fragmented accessibility, multi-scale spaces and uses, informal local transport	Reflects the limitations of integrated land, transport, and green area planning	The lack of ecological connectivity reduces urban resilience and equitable access to the landscape.
TOD	Proximity to the Metropolitan Area and unconsolidated pedestrian access routes.	Contrasts the compact model of the TOD with the dispersed reality of the area	Requires strategies that integrate public transport and green corridors to conserve the area.

Table 1. Theoretical summary of findings and implications for landscape conservation. Source: Preparation by the authors.

irregular; they have sidewalks, streets, and even gardens. The width of the streets is on a neighborhood scale. In the neighborhoods on the upper slopes, there is limited consolidation; the only stores are convenience stores. The roads, in general, are narrow and irregular; they can be passageways, vehicle passageways, or stairs, without paved earth or cement sidewalks. The spaces have a neighborhood scale.

These results show an unplanned spatial and functional transition between mass transportation and a natural ecosystem, without pedestrian continuity or landscape criteria. However, in hillside neighborhoods, neighborhood appropriation is seen through the community facilities, residual open spaces, and spontaneous community uses, such as intense pedestrian circulation and neighborhood events, without infrastructure that consolidates this dynamic as part of the routes to the hill. This represents a strategic opportunity to link micro-mobility and pedestrian movements from neighborhoods to metropolitan nodes through TOD principles that integrate sustainable urban mobility and urban landscape (Table 1).

Local initiatives for the hill's conservation

Hill conservation is primarily supported by local community-based initiatives managed by neighborhood organizations, environmental groups, and institutional stakeholders at the district scale. These emerge in response to the lack of specific public policies for managing hill ecosystems in Lima, which constitute an incipient, yet active, environmental governance system.

The local initiatives by the neighbors can be classified into cultural, educational, sports, recreational, community, and management initiatives. Among the most frequent actions to conserve the hill are community cleaning and reforestation days; guided ecological walks, trekking, hiking, environmental

education activities led by youth groups and local teachers; thematic parades, photo exhibitions, self-managed ecotourism projects, as well as neighborhood warnings and complaints against invasions, dumping sites, and uncontrolled burning. These practices have made the ecological and landscape value of the hill visible by fostering social appropriation of the area and community environmental awareness. These initiatives impact the use, protection, and upkeep of the hill's access points. It is also worth noting that there are municipal programs and projects aimed at integrating the hills into the urban fabric through forestation, circular economy, and ecotourism circuits. However, so far, they have had limited impact on the hills and have not considered hillside neighborhoods in their strategies.

Nevertheless, over time, these initiatives have faced structural challenges: a lack of technical and financial resources, weak institutional articulation, limited continuity, and constant pressures from informal urbanization. Despite this, there are also strategic opportunities, such as increasing citizen awareness, valorizing the landscape as a common good, and linking these community actions to metropolitan strategies for sustainable mobility and ecological planning. In this context, the hill's conservation becomes a process of social and local co-management, where local stakeholders play a key role amid institutional gaps, opening the possibility of integrating community governance and sustainable urban planning (Table 1).

VI. DISCUSSION

The case questions the relationship between sustainable urban mobility and landscape conservation in informal peripheral urban areas where planning is fragile and informal expansion is the dominant pattern. At the same time, the case forces a rethinking of the TOD model in informal contexts.

Namalwa et al. (2024) and Bressane et al. (2024) highlight the importance of improving institutional policies and frameworks that affect the conservation of green spaces in vulnerable urban areas, given the lack of coordination among institutions and the ineffective implementation of regulations. Meza Llinás (2021) and Iusry Abulatif et al. (2020) indicate that development using the TOD model in Latin American cities presents challenges such as the lack of homogeneity around transport nodes.

On the hill, the TOD model is working in an incipient way thanks to the combination of State and community management, as the participation of the district's residents is decisive in generating awareness and engagement, and in maintaining access to the hills. The case shows that community conservation and local mobility practices constitute non-formalized, but functional, sustainable urban mobility mechanisms that can be strategically integrated into public policies. The nearby metropolitan infrastructure, such as the Metropolitan bus system, is insufficient to generate sustainable urban mobility. Because of this, it is necessary to develop local mechanisms that enable a true connection to the hill, linking accessibility, uses, multi-scale spaces, and neighborhood participation.

The circuits to the hill underscore the need for multimodal transport, given the district's morphology and topography. This shows that it is necessary to rethink how the TOD model is inserted in these neighborhoods. Therefore, the case study allows reflection on the importance of using micromobility to link TOD nodes and urban landscape areas, especially in districts with neighborhoods of diverse urban scales, such as Independencia, which has spaces at both metropolitan and neighborhood scales. Several studies (Pomaquero-Yuquilema & Sánchez-Valdez, 2020; Iturraran Zapata et al., 2023) have indicated that micromobility, or neighborhood mobility, across different scales is a determinant of sustainable urban mobility. However, it is argued that the neighbors only create these means in a basic way, rather than the State, when the landscape areas are green spaces in the city that deserve greater protection. This could, at the same time, represent an opportunity to improve on-site micro-mobility conditions from the State when considering local initiatives.

The case study also raises questions about how urban uses can improve the circuit to the hills or to any landscape area. In the case study, although these uses are not strictly designed for the hill's benefit, but rather for the district's needs, they help generate more attractive routes to the hills, especially at the neighborhood and inter-neighborhood scales (Figures 4 and 5). This represents an opportunity to promote more urban uses linked to the hill to strengthen the circuits.

VII. CONCLUSIONS

Analysis of the hill shows that the relationship between sustainable urban mobility and landscape conservation in informal urban contexts presents challenges and opportunities that must be addressed together. Firstly, regarding accessibility at the metropolitan and local scales, there is a disconnect between the mass transport infrastructure (metropolitan stations), provided by the State, and the local mobility systems proposed by the neighbors. Although the hill is located close to TOD nodes, the lack of green corridors between the hill and these nodes reveals the absence of multimodal planning that integrates transport and landscape.

Secondly, the types of spaces and uses along the route evidence a slope that transitions from consolidated areas, with intense urban activities on a metropolitan scale, but lacking sustainable urban mobility infrastructure designed to protect the hill, towards transitional spaces with uses on an inter-neighborhood and neighborhood scale, and, finally, towards an ecological edge with improvised paths. This spatial sequence has not been planned, which presents a challenge, but also an opportunity, since although the morphology of the hillside neighborhoods limits accessibility, it also opens the possibility of structuring landscape corridors with multi-scale spaces that combine local mobility and ecological conservation under TOD principles.

Thirdly, local conservation initiatives are a relevant form of social capital that enables sustainable practices in environmental education, responsible ecotourism, and community monitoring. These initiatives face structural challenges (financing, inter-institutional coordination, urban pressures), but they also create opportunities to align with Metropolitan policies on sustainable mobility and ecological management. Public policies for ecosystem conservation should include neighborhood participation, since it is not institutionalized, and neighbors work in a self-managed manner. The residents of the hillside neighborhoods are an important group in preserving access to the hill, as their surveillance and cultural activities foster security and revitalization.

The article contributes to the debate on sustainable urban mobility and landscape conservation in Latin American metropolitan contexts by showing that the TOD model can be adapted to informal urban contexts if the importance of urban ecosystems and the active role of local communities are recognized. This integration of accessibility, landscape, and community management not only improves connectivity across multiscale areas but also redefines

urban mobility as a local sustainability strategy, strengthening the bonds between the city and nature.

VIII. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, D.L.Q.T., O.F.C.V.; Data curation, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.; Formal analysis, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.; Acquisition of financing, D.L.Q.T., O.F.C.V., A.R.C.; Research, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.; Methodology, D.L.Q.T.; Project Management, D.L.Q.T.; Resources, D.L.Q.T., O.F.C.V., A.R.C.; Software, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.; Supervision, D.L.Q.T.; Validation, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.; Visualization, D.L.Q.T., I.V.D.C.; Writing – original draft, D.L.Q.T.; Writing – revision and editing, D.L.Q.T., O.F.C.V., I.V.D.C., A.R.C.

IX. BIBLIOGRAPHIC REFERENCES

Abramo, P. (2007). A cidade com-fusa: A mão inoxidável do mercado e a produção da estrutura urbana nas grandes metrópoles latino-americanas. *Revista Brasileira de Estudos Urbanos e Regionais*, 9(2), 25–39. <https://doi.org/10.22296/2317-1529.2007v9n2p25>

Álvarez Vanegas, A. (2020). Movilidad urbana sostenible: ciudades benignas. *Revista Universidad EAFIT*, 55(175), 40-41. <https://publicaciones.eafit.edu.co/index.php/revista-universidad-eafit/article/view/6452>

Bressane, A., Silva, A., De Castro, L., Galante, G., & García, A. (2024). Overcoming Barriers to Managing Urban Green Spaces in Metropolitan Areas: Prospects from a Case Study in an Emerging Economy. *Sustainability*, 16(16), 7019. <https://doi.org/10.3390/su16167019>

García, R., Miyashiro, J., Orejón, C., & Pizarro, F. (2014). *Crecimiento urbano, cambio climático y ecosistemas frágiles: el caso de las lomas de Villa María del Triunfo en Lima Sur*. https://www.desco.org.pe/recursos/site/files/CONTENIDO/25/14_Garcia-otros_PHdic14.pdf

Hanna, E., & Comín, F. A. (2021). Urban green infrastructure and sustainable development: A review. *Sustainability*, 13(20), 11498. <https://doi.org/10.3390/su132011498>

Iturraran Zapata, R., Ascencios Bazán, C. A., Soto Huamán, J. R., & Matías León, J. C. (2023). Propuesta de lineamientos para la integración de la micromovilidad en Lima Metropolitana. *Tecnía*, 33(1), 10-20. <https://doi.org/10.21754/tecnia.v33i1.1456>

lusray Abulatif, L., Souza Silva, A., & Colusso, I. (2020). Transport oriented development as urban sustainability practices inductor in emergent middle-size cities. *Polis (Santiago)*, 19(56), 185-213. <https://dx.doi.org/10.32735/s0718-6568/2020-n56-1526>

Jacobs, J. (1961). *Muerte y vida de las grandes ciudades*. Capitán Swing Libros.

Meza Llinás, V. (2021). *Evaluando el potencial del desarrollo orientado al transporte considerando las preferencias y percepciones de los ciudadanos* [Tesis Maestría, Universidad del Norte]. LA Referencia Red de repositorios de acceso abierto a la ciencia. https://www.lareferencia.info/vufind/Record/CO_9dc126e63fc5cc34b1b2a3e056760fb6

Ministerio del Ambiente (MINAM) y Sistema Nacional de Información Ambiental (SINIA). (20 de diciembre de 2021). *Mapa de lomas costeras Lima Metropolitana*. Sinia. <https://sinia.minam.gob.pe/mapas/mapa-lomas-costeras-lima-metropolitana-2021>

Namalwa, S. M., Omollo, M., & Konana, C. (2024). An analysis of urban green space policies, laws and institutional frameworks in Dandora Estates, Nairobi County. *Journal of the Kenya National Commission for UNESCO*, 4(1), 1-19. <https://doi.org/10.62049/jkncu.v4i1.81>

Nieuwenhuijsen, M. J., Dadvand, P., Márquez, S., Bartoll, X., Barboza, E. P., Cirach, M., Borrel, C., & Zijlema, W. L. (2022). The evaluation of the 3-30-300 green space rule and mental health. *Environmental research*, 215, 114387. <https://doi.org/10.1016/j.envres.2022.114387>

Nieuwland, B., & Mamani, J. M. (2017). Las lomas de Lima: enfocando ecosistemas desérticos como espacios abiertos en Lima metropolitana. *Espacio y desarrollo*, (29), 109-133. <https://doi.org/10.18800/espacioydesarrollo.201701.005>

Nguyen, P.-Y., Astell-Burt, T., Rahimi-Ardabili, H., & Feng, X. (2021). Green space quality and health: a systematic review. *International Journal of Environmental Research and Public Health*, 18(21), 11028. <https://doi.org/10.3390/ijerph182111028>

Orellana-Alvear, B., López-Hidalgo, A., Maldonado-Matute, J., & Vanegas-Delgado, V. (2017). Fundamentos de la biofilia y neuroarquitectura aplicada a la concepción de la iluminación en espacios físicos. *Maskana*, 8, 111-120. <https://publicaciones.ucuenca.edu.ec/ojs/index.php/maskana/article/view/1881/1381>

Pomaquero-Yuquilema, P. A., & Sánchez-Valdez, D. E., (2020). Evaluación de la movilidad barrial a través de indicadores de sustentabilidad. *Polo del Conocimiento*, 5(10), 963-986. <https://www.polodelconocimiento.com/ojs/index.php/es/article/view/1865>

Ponce, C., Román García, D., & Chávez Arana, K. (2022). Movilidad urbana en zonas periféricas: una mirada comparada de tres distritos de Lima Metropolitana. *Bulletin de l'Institut français d'études andines*, 51(1), 13-33. <https://doi.org/10.4000/bifea.13756>

Rasidi, M. H., Jamirsah, N., & Said, I. (2018). Development of urban green space affects neighbourhood community social interaction. *Asian Journal of Environment-Behaviour Studies*, 3(8), 79-88. <https://doi.org/10.21834/aje-bs.v3i8.281>

Reaño Torres, A. (19 de abril del 2022). *Lomas De Amancaes, Bella Durmiente - Área De Conservación Regional Sistema de Lomas de Lima*. Recursos Turísticos. Municipalidad Metropolitana de Lima - Subgerencia de Turismo. https://consultasenlinea.mincetur.gob.pe/fichalventario/index.aspx?cod_Ficha=10319

Robert, J., & Pereyra, O. (2024). Más allá de los modos. La experiencia de la «movilidad sostenible» en las periferias populares de Lima. *Ensayo: Revista de arquitectura, urbanismo y territorio*, (4), 55-71. <https://doi.org/10.18800/ensayo.202404.003>

Rodríguez, D. A. (2021). *Desarrollo Orientado al Transporte: una evaluación de tendencias y oportunidades para América Latina*. Banco Interamericano de Desarrollo. <https://publications.iadb.org/es/publications/spanish/viewer/Desarrollo-orientado-al-transporte-una-evaluacion-de-tendencias-y-oportunidades-para-América-Latina.pdf>

Sánchez, D. (2022). *Ecosistema de lomas relicto de pampa de Amancaes. Distrito de Independencia-Lima Metropolitana* [Tesis de maestría, Universidad Nacional Federico Villarreal]. Repositorio Institucional UNFV. <https://hdl.handle.net/20.500.13084/6129>

Seisdedos, G. (2007). *Como gestionar las ciudades del siglo XXI. Del City Marketing al Urban Management*. Pretice Hall.

Tanikawa-Obregón, K., & Paz-Gómez D. M. (2022). El peatón como base de una movilidad urbana sostenible en Latinoamérica: una visión para construir ciudades del futuro. *Boletín de Ciencias de la Tierra*, (50), 29-34. <https://doi.org/10.15446/rbct.n50.94842>

Taylor, K. (2025). Urban Open Space Systems and Green Cities: History, Heritage, and All That. *Land*, 14(3), 582. <https://doi.org/10.3390/land14030582>

Vega Centeno, P., Robert, J., Demoraes, F., Robert, J., Moreno Luna, C., & Gouëset, V. (2022). Estructura urbana y movilidad como factores de vulnerabilidad. Lima y Bogotá en tiempos de cuarentena. *Bitácora Urbano Territorial*, 32(2), 47-62. <https://doi.org/10.15446/bitacora.v32n2.99425>

Vilanova, C., Ferran, J. S., & Concepción, E. D. (2024). Integrating landscape ecology in urban green infrastructure planning: A multi-scale approach for sustainable development. *Urban Forestry & Urban Greening*, 94, 128248. <https://doi.org/10.1016/j.ufug.2024.128248>

Zuniga-Teran A. A., Gerlak, A. K., Elder, A. D., & Tam, A. (2021). The unjust distribution of urban green infrastructure is just the tip of the iceberg: A systematic review of place-based studies. *Environmental Science & Policy*, 126, 234-245. <https://doi.org/10.1016/j.envsci.2021.10.001>

X. ACKNOWLEDGMENTS

The article was developed within the framework of an academic competition organized by the Vice-Rectorate of Research of the National University of Engineering (Lima, Peru). This space promotes critical reflection and applied research on contemporary urban challenges. We express our sincere gratitude to the institution for promoting initiatives that connect academic training with the real problems of the city of Lima.

We also thank the local communities and the stakeholders of La Loma La Bella Durmiente, whose experience and knowledge of the environment have been essential to understanding the relationship between urban mobility and landscape conservation.

We also thank the publisher for its interest in disseminating this work and for the support provided during the review and publication process, which helped this research reach a wider audience.

URBAN DEVELOPMENT AND INDIGENOUS PEOPLES: THE RETXIKURA ROCK AND THE "LOMAS DEL LAGO VILLARRICA" REAL-ESTATE PROJECT, CHILE ¹

DESARROLLO URBANO Y PUEBLOS INDÍGENAS: PIEDRA RETXIKURA Y PROYECTO
INMOBILIARIO "LOMAS DEL LAGO VILLARRICA", CHILE

IGNACIO FELIS ²
MATTHEW CAULKINS ³

¹ Artículo financiado por ANID Fondecyt Iniciación 11241033 (IR: Matthew Caulkins)

² Magister en Procesos Urbanos Sostenibles Arquitecto Proyectista en Urbanismo
Universidad de Concepción, Concepción, Chile
<https://orcid.org/0009-0001-6249-0223>
ignaciofelis@gmail.com

³ Doctor en Estudios Urbanos
Académico del Departamento de Urbanismo de la Facultad de Arquitectura, Urbanismo y Geografía
Universidad de Concepción, Concepción, Chile
<https://orcid.org/0000-0003-2544-1518>
mcaulkins@udec.cl

La regulación del desarrollo urbano en Chile es extremadamente permisiva. Aprueba casi automáticamente los proyectos de urbanización en áreas urbanas que cumplan con la normativa vigente. Sin embargo, el aumento reciente de la población indígena en ciudades chilenas ha creado una “zona de contacto” entre esa población y los procesos de aprobación de esos proyectos inmobiliarios. A partir del caso de estudio de la expansión inmobiliaria en torno al Monumento Arqueológico Nacional Piedra Retxikura, ubicado adyacente al sector Segunda Faja en Villarrica, Región de La Araucanía, Chile, esta investigación busca analizar en qué medida se incluye realmente a la población indígena en los procesos de planificación y regulación del desarrollo urbano chileno. Mediante un enfoque cualitativo basado en entrevistas semiestructuradas, revisión documental y recopilación de datos empíricos, se analizaron las experiencias de actores clave, tanto comunitarios como institucionales. El estudio evidencia la ausencia de un enfoque intercultural y la colonialidad en la configuración de los procesos de planificación que delegan en los titulares de proyectos sometidos al Servicio de Evaluación de Impactos Ambientales la toma de decisiones respecto de poblaciones indígenas. Esto conduce a la exclusión total de la comunidad originaria del proceso de toma de decisiones sobre proyectos inmobiliarios.

Palabras clave: consulta indígena, planificación urbana, desarrollo urbano, sistema de evaluación de impacto ambiental

Chilean urban regulations are extremely permissive. They almost automatically approve development projects in urban areas that comply with current regulations. However, the recent increase in the Indigenous population in Chilean cities is creating a “contact zone” between this group and urban development approval processes. Based on a case study of the real estate expansion around the Piedra Retxikura National Archaeological Monument, located alongside the Segunda Faja sector of Villarrica, Araucanía Region, Chile, this research seeks to analyze the extent to which the Indigenous population is included in the planning and approval processes for urban development projects. Through a qualitative approach based on semi-structured interviews, document review, and empirical data collection, the experiences of key actors, both community and institutional, were analyzed. The study highlights the absence of an intercultural approach and the coloniality in the organization of planning processes that delegate decisions regarding Indigenous peoples to proponents of development projects submitted to the Environmental Impact Assessment System. This leads to the complete exclusion of the Indigenous community from the decision-making process regarding real estate projects.

Keywords: indigenous consultation, urban planning, urban development, environmental impact assessment system

I. INTRODUCTION

Only a couple of decades ago, it was uncommon to question the approval of a real estate project in Chile on the grounds that it interfered with indigenous cultural practices. Around 2000, the approval of urban development projects was fundamentally a bureaucratic and technical matter within the competence of the Municipal Works Directorate and, therefore, in practice, did not involve the local population. However, over the next few years, a series of citizen conflicts arose in districts of Santiago's Metropolitan Region (Vitacura in 2004, Lo Espejo in 2005, Ñuñoa in 2006, etc.) that questioned this exclusionary logic (Agüero et al., 2014; Caulkins, 2020; Parraguez Sanchez, 2012). Subsequently, the Law on Citizen Participation (Law 20,500, 2011) and the Decree regulating the procedures for Indigenous Consultation in the country (Decree 66, 2014) were approved. Nowadays, this set of social and regulatory changes includes urban planning, regulatory plans, and the daily work of approving and/or regulating urban development, which is receiving increasing opposition from citizens. Indeed, recently, an indigenous population in the city of Concepción managed to reverse the approval of the Metropolitan Regulatory Plan by having it discussed again, including them as participants in the new process (Gore Biobío, 2022).

In Chile, urban planning is mainly limited to preparing and applying regulatory instruments, including the General Law of Urbanism and Construction, its Ordinance, and the Regulatory Plans at the Sectional, Communal, and Intercommunal levels. Recent authors even go so far as to describe the Chilean case as "urbanism by decree," a commodified context in which projects that do not contradict current regulations are approved almost as an acquired right (Schuster-Olbrich et al., 2024; Sierra, 2006; Vicuña Del Río, 2013). This is especially important for indigenous populations affected by urban development projects in their regions.

This article will review a case of the Mapuche people's opposition to the approval of an urban development project around a site of great significance to them. The Retxikura Stone National Archaeological Monument (Figure 1) is located in a highly relevant urban, environmental, and heritage context (Aguilera, 2022). However, the area's accelerated real estate growth has fragmented its water system and affected this pre-Hispanic archaeological site, recognized by the Historical Heritage Corporation of Villarrica and the National Monuments Council.

The "Lomas del Lago Villarrica" urbanization project, set around the Retxikura Stone, comprises 600 residential units, 640 parking spaces, and 7 commercial premises. The 6.75ha project seeks to extend the city toward the lake by



Figure 1. Piedra Retxikura National Historical Archaeological Monument. Source: Preparation by the authors.

forcibly breaking into the sector, thanks to its scale and its projection into previously protected forest areas, estuaries, and archaeological sites.

Although urban development regulations and indigenous recognition laws (such as Law 19.253, 1993) do not have formalized points of intersection in Chile, the increased migration of originally rural indigenous populations to cities and the expansion of urban areas that may incorporate rural indigenous lands (Caulkins et al., 2023) produce a "contact zone" between both regulatory bodies (Porter & Barry, 2016). The General Urban Planning and Construction Law does not address this indigenous population in cities, but the National Urban Development Policy (PNDU), in its 2014 update, identified identity and heritage as important factors. However, only since the passing of Decree 66 (2014) has the right to indigenous consultation in Chile become concrete.

This article seeks to contribute to recent efforts to understand the relationship between urban planning and indigenous peoples (Caulkins et al., 2023; Porter & Barry, 2016). In particular, it is proposed to analyze how urban development, and specifically the approval of real estate projects, is related to the right to indigenous consultation.

The text below this introduction is organized as follows. The next section reviews the scientific literature on urban development regulation, regional justice, and its relationship with the administrative approval of real estate projects in Chile, to provide a reference framework for interpreting the contact zone created by the “Lomas del Lago Villarrica” project (Figure 2). After that, the methodology used for the case study is presented, highlighting a focus on understanding the regulations governing the project’s approval and on participant observation by one of the authors. The results of the analysis of the approval structure for real estate projects, along with interviews with key players, are then presented. The article suggests that administrative reforms are needed so that indigenous peoples can participate in better conditions in the planning and regulation of urban development.

II. THEORETICAL FRAMEWORK

Urban development disputes

The real estate expansion in Chile has reconfigured urban landscapes, driven by a mercantile logic that guides urban regulations and subordinates them to real estate profitability interests (Kramer Grand, 2019). The growing real estate speculation and the commodification of the landscape have transformed these natural environments, with a greater presence along the coasts (Oyarce Avilés, 2020). Zunino et al. (2011) point out that, in particular, the densification of the Villarrica area has been driven by real estate projects offering privileged access to the lake.

This real estate pressure has begun to impact peri-urban indigenous lands in cities such as Temuco (Rojo-Mendoza et al., 2022; Prada-Trigo et al., 2021). Núñez et al. (2022) suggest that these urban logics strain culturally significant places for indigenous peoples and their traditional ways of living in community. When reviewing recent literature, cases stand out where urbanization affects spiritual ceremonies in an indigenous community in the commune of Padre Las Casas (Imilan et al., 2023), an electrical substation for the metro affecting the *rewe* of neighboring municipal land⁴ in Pudahuel, Santiago Metropolitan Region (Caulkins et al., 2023),



Figure 2. Lomas de Villarrica Real Estate Project and Alto Costanera Avenue. Source: Preparation by the authors based on material provided by the NGO “Salvemos la Piedra Retxikura”.

or a real estate development next to the Topater indigenous cemetery of Atacama communities (Fuenzalida, 2015).

However, very little has been written about the relationship between urban development regulation and indigenous peoples. In Canada and Australia, Porter and Barry (2016) analyze urban and rural instances of “contact zones”, social spaces where indigenous culture meets local regional planning bureaucracies. They insist that achieving concrete results depends not only on the efforts of these peoples and well-intentioned bureaucrats, but also on more structural elements: on the institutional rules that require State actors to include the peoples in decision-making and to transfer capacities to them so they can participate more meaningfully.

As for the Chilean case, Caulkins et al. (2023, p. 1) point to the insufficient recognition of indigenous peoples’ status in urban planning, thereby denying them effective participation in the formulation, implementation, and evaluation of plans likely to affect them directly. On the other hand, planning and regulation continue to reproduce a dichotomous colonial logic in which indigenous peoples are assigned only to rural areas of the country for land-granting, not to urban areas (Ugarte et al., 2019).

Urbanization, indigenous population, and regional justice

The cases reported in the literature demonstrate that the colonial development matrix affects indigenous peoples in

⁴ The Evaluation Commission of the Metropolitan Region, in its Resolution 67 of February 4, 2013, required the company Transelec S.A., within the framework of the project’s Environmental Impact Assessment, to conduct an Indigenous Consultation process. This is the only case of Indigenous Consultation derived from the Environmental Impact Study of an urban project known to date in the country.

Data sources	Purpose	Addressed to
Semi-structured interviews	Collecting stakeholders' insights and experiences.	9 participants: 2 from Environmental Institutions, 2 from indigenous communities, 3 from local environmental NGOs, 1 from Local Government, 1 from a person in charge of local heritage.
Documentary review	Identifying gaps and opportunities for improvement.	Law 19.300, Environmental Impact Assessment System Regulation [RSEIA, in Spanish], Indigenous Participation and Consultation guides, and international standards. Academic articles on the Effects of Urban Expansion and Real Estate Projects, Interculturality, Socio-environmental Impacts, Indigenous Participation and Consultation Mechanisms, among others.
Participatory observation	Validating impacts and corroborating perceptions.	Cultural dynamics, use of ceremonial spaces, and instances of participation

Table 1. Data source. Source: Preparation by the authors.

both urban and rural contexts (Mansilla Quiñones & Imilan Ojeda, 2020). The indigenous population, when seeking greater regional justice, seeks recognition as a legitimate interlocutor (Coulthard, 2014; Herrera Amaya, 2018). However, within State processes, citizen participation appears as merely symbolic, without entailing participation in decision-making.

Ugarte Urzua (2019) analyzes the process of drafting Decree 66, which regulates Indigenous Consultation in Chile. Article 7 requires the State to consult with indigenous populations regarding any administrative measure that may affect them. On the other hand, Article 8 regulates the approval of private projects evaluated under the Environmental Impact Assessment System. On the one hand, the few studies to date (Caulkins et al., 2023) have analyzed the impacts of Indigenous Consultation on State administrative measures. However, no literature reviews the effects of private project approval on Indigenous peoples' rights. So far, in Chile, only Environmental Assessment for mining and large energy projects has been extensively studied (Barría Meneses, 2019), leaving real estate developments unstudied.

The Environmental Impact Assessment System (SEIA, in Spanish) determines whether a project or activity causes environmental changes and whether it complies with the country's regulations. To do this, the owners must comply with Law 19,300 (1994) and the SEIA Regulations (Decree 40, 2012, Articles 10 and 3) to determine whether their project requires an Environmental Impact Assessment under the modality of an Environmental Impact Statement (DIA, in Spanish) or an Environmental Impact Study (EIA, in Spanish). Article 7 of the Regulation requires an EIA for projects with direct impacts on indigenous communities, considering their duration, magnitude, and vulnerability to climate change that affect their natural resources, mobility, access to basic services, and worldview. On the other hand, Article

10 of Law 19,300 requires an Environmental Impact Study for urban development projects only when they are not included in areas designated by regional land-use planning plans, regulatory plans of different hierarchies, regional urban development plans, and coastal edge zoning.

The Indigenous Consultation processes in the SEIA seek agreements with indigenous peoples on measures that could affect them. These meetings should be consultations in good faith prior to the environmental assessment, in which cultural particularities are respected (Decree 40, 2012, Title V. Art. 85). However, Faúndes Peñafiel and Campos Mello (2024) point out that the consultation depends on the level of affectation understood as a "precautionary requirement of probable effects", without the need for prior checks, and must be carried out by the SEA (Environmental Assessment Service) when a project significantly impacts indigenous peoples. On the other hand, the SEIA Regulation (Decree 40, 2012) establishes that the Indigenous Consultation must address potential impacts, mitigation measures, compensation, reparation, and the project owner's voluntary commitments.

Thus, the question remains whether the regulation of Chilean urban development adequately addresses the requirements of Convention 169 of the International Labor Organization, ratified in Chile (Decree 236, 2008), or merely symbolically recognizes the right to consultation.

III. METHODOLOGY

In the following research, a qualitative approach was used to examine the scope of Indigenous Consultation in the approval of significant urbanization projects, drawing on the experiences of the different stakeholders in the case study.

Aspect	DIA	EIA
Evaluation period	60 days	120 days
Extension of the evaluation period	30 days	60 days
Citizen participation	If requested, if there are environmental positions	Always
Indigenous Consultation	Not applicable	When there is a significant impact on indigenous peoples
Appeal process	Before the SEA's Executive Director	Before the Committee of Ministers

Table 2: Differences between Environmental Impact Statements (DIA) and Environmental Impact Studies (EIA). Source: Prepared by the authors based on information from the SEA.

The research collected data through interviews, observation, and documentary analysis (Table 1). Participant observation conducted by one of the authors during the project's citizen participation process in August 2024 was also included. Results were triangulated with interviews with Environmental Assessment Service officials [SEA], Mapuche communities, the municipal Cultural Advisor, and a local environmental NGO. All the interviewees were informed about the project and asked to sign an informed consent. Only SEA officials asked that their names not be revealed. The interviews were transcribed and subsequently analyzed according to the research topics.

IV. RESULTS

The evaluation system of urban development projects is structured to facilitate their approval. Table 2 shows a structural discretion in the choice of evaluation between the more expeditious Environmental Impact Statement (DIA) or the more demanding Environmental Impact Assessment (EIA). When analyzing the data available on the SEA's website ([SEA], 2026), it is noted that between 2017 and 2025, the Environmental Impact Statement was used in more than 90% of the cases. The vast majority of EIA or DIA applications are approved. The rejection rate varied from 2.4 to 6.2%. In 2019 and 2024, for example, 0% of real estate projects were rejected. In the years reviewed, the rejection rate for real estate projects ranged from 0% to 4.8%, and only in 2022 did it reach 11.5%. Carmona Caldera (2020) shows that limiting Indigenous Consultation to EIAs reduces their participation (4.6% in the SEIA, between 1992 and 2017), making impacts invisible and requiring technical or environmental impact evaluations, which dilute the debate on impact and mitigation.

As a complement to this structural analysis, interviews were conducted to understand the participants' experience. The Mapuche communities report that work undertaken prior to the construction of the "Lomas del Lago Villarrica" real estate

project proposed by the developer Martabid has fragmented their spiritual link with ecosystems, and that this impact is not considered in the project's Environmental Assessment. Their examples include altering the natural slopes of the hills with heavy machinery, modifying watercourses, and deforesting native vegetation in the vicinity of the Retxikura Stone National Archaeological Monument—all of which occurred prior to the project's approval.

The real estate project adjacent to the Retxikura Stone National Archaeological Monument affects the wetlands (*Menoko*) and centennial forests (*Aliwen*), which are essential to the Mapuche cosmovision and their traditional activities (Figure 3). The community highlights several important spaces, such as the estuary and its pampa, where significant activities take place (Table 3).

As a result, there is inadequate representation of the affected communities in the Evaluation System, leading to the omission of relevant environmental and cultural characteristics in the studies preparing the Environmental Impact Statement, and to the transgression of ceremonial spaces and cultural sites during pre-construction activities.

One of the issues highlighted most by the interviewees is the omission of cultural characteristics in the Environmental Impact Assessment Service. An SEA official mentioned (interview September 13th, 2024) that regional planning and environmental assessment are clearly on different tracks. For the Lomas de Villarrica project, the owner's company submitted an Environmental Impact Statement (DIA) to the SEIA, with attached site and local context analysis reports, on Folio 2024-09-244-2 (Environmental Assessment Service [SEA], 2024). The president of the NGO, *Salvemos la Piedra Rexicura*, explained (Beltrán, P., personal interview, September 25th, 2024) that the company behind the project hired consultants to conduct the studies needed to submit the project's DIA. However, there were "clear shortcomings in capturing the

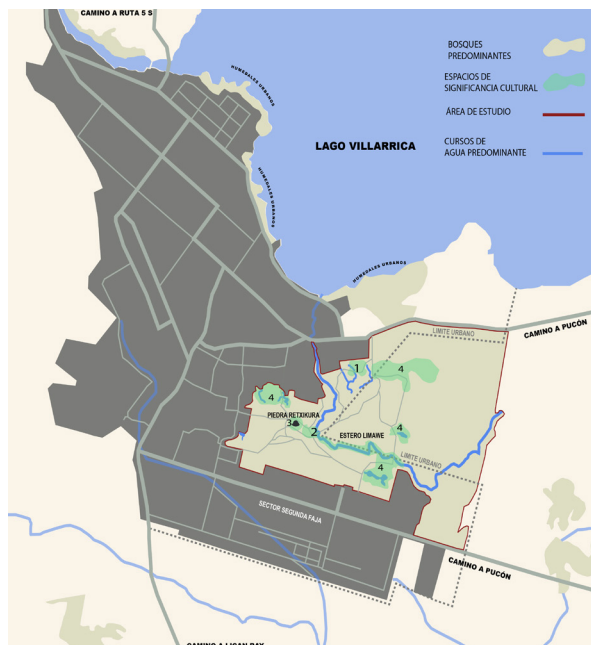


Figure 3. Main spaces of cultural significance in the study area.
Source: Preparation by the authors based on visits and interviews with local actors between July 2023 and June 2025.

sector's reality" because they ignored fundamental cultural practices such as *Ngillatun*, *We Tripantu*, and areas of *Nguillatu*, as well as ceremonial spaces and *Ngen* (protective spirits). This omission shows that "the impact assessment system benefits the owner rather than the people."

According to Sánchez Curihuentro (2001), these natural spaces are considered the "heart of Mapuche culture", differing from Chilean culture, where places of worship are marked out and built. Regarding these spaces, a SEIA official emphasizes (Personal interview, September 13th, 2024) the need for a comprehensive analysis that considers "all elements such as noise, atmospheric emissions, road use, and the effect on natural resources, among others." However, from the perspective of the director of the Historical and Heritage Corporation of Villarrica (Aguilera, M., personal interview, June 26th, 2024), the spiritual limits of the ceremonial zones should also be recognized:

What is the influence of the river, spiritually? Where are its edges? This issue is very important and sensitive; these questions have to be answered by the right people (from Mapuche communities). The spiritual boundaries of sacred elements for the Mapuche people are based on geographic characteristics and on how certain natural elements manifest.

Area	Activities
1. Boldo Forest	Environmental Conservation, Mapuche Ceremonies, Environmental Education, Archaeological Site
2. Limawe Estuary	Mapuche Ceremonies, Collection of Medicinal Herbs, Archaeological Site
3. Limawe Estuary Pampa	Mapuche Ceremonies, Environmental Education, Palin (Traditional Mapuche Game)
4. Hualve-Aliwen (Wetlands - Ancient forests)	Environmental Conservation, Collection of Medicinal Herbs, Environmental Education

Table 3. Areas of cultural significance. Source: Preparation by the authors based on interviews with local actors between July 2023 and June 2025.

In this context, the Cultural Advisor from the Indigenous Development Office of the Municipality of Villarrica stresses (Marín Manquecoy, H., personal interview, October 11th, 2024) the importance of "validation from the *Lonko*, *Kimche*, *Lawentuchefe*, among others", who must be included in the project's evaluation, for example, in the layout of the subdivision's avenues (Figure 4).

The Director of Villarrica's Historical and Heritage Corporation (Aguilera, M., personal interview, June 26, 2024) points out that the current system places excessive responsibility on the project owners: "We rely on the professional ethics of the consultants and owners who conduct the studies." This is exemplified by the disconnect between the Environmental Impact Statement (DIA) and the reality of the area, where:

According to the DIA, there are no cultural traditions and archaeological remains in the area. This means an aberrant disconnection from Environmental Law; it is an inconsistency with the spirit of the law that evidences the system's capture by economic interests.

The SEA official mentioned above explains (Interviewee A, personal interview, September 13th, 2024) that:

One of the most important matters that has become relevant in the last ten years is the human-environment interface as a component of environmental assessment. That means more challenges in terms of methodologies to understand the socio-territorial context better.



Figure 4. Alto Costanera Avenue. Source: Prepared by the authors (2025).

To counteract this situation, (Aguilera, M., personal interview, September 13th, 2024) insists that Historical Heritage Land Registries need to be created for the Region, in collaboration with State institutions and indigenous organizations, as a tool to validate the information presented by the project owners. Something similar was implemented in Colombia in 2023 with the Land Registry Management by Indigenous Communities Agreement. This Multipurpose Land Registry registers boundaries, physical characteristics, land uses, and cultural values of indigenous areas (Government of Colombia, 2025). It was developed through prior consultation and included training for communities to manage their areas, as well as specific regulations. This process, which could be emulated in Chile, combines efforts between the government, public-private institutions, and communities, integrating technical, cultural, and spiritual values in regional management.

The concern of the Villarrica Historical and Heritage Corporation Director, Marco Aguilera, is supported by an official letter from the National Monuments Council (CMN) dated June 7th, 2024, addressed to the SEA, regarding the Environmental Impact Statement presented by the Martabid Real Estate Company for the “Lomas del Lago Villarrica” project. The CMN argued that the DIA “does not present the background information needed to certify that the project does not have any of the effects, characteristics or circumstances described in letter f) of article 11 of Law 19,300” (1994) (letter f indicates: alteration of monuments, sites of value, anthropological, archaeological, historical and, in general, those belonging to the cultural heritage) given

the presence of archaeological findings and sites of cultural importance in the area. In addition, the project clearly violates letter “c” of Article 11 of the SEA Regulation (Decree 40, 2012) by significantly altering the customs of the local Mapuche population in their ceremonies at the Retxikura stone. Faced with this situation, the CMN requested a “preventive archaeological characterization” during the Environmental Assessment, stressing the need to consider cultural heritage in the process.

V. DISCUSSION

The review of the results shows a structurally insufficient response regarding the obligations from the ratification of ILO Convention 169 (Decree 236, 2008). This is because the approval of real estate projects in Chilean urban areas relies uncritically on the Environmental Assessment System (SEA) to determine whether consultation with the indigenous population is required. The SEA, for its part, accepts that they are included in this case within a Regulatory Plan and that it would not be necessary to evaluate the urbanization project more closely. Although the project clearly and significantly affects the customs of the local Mapuche population in their ceremonies around the Retxikura stone and impacts a declared National Archaeological Monument, the project owner could submit an Environmental Impact Statement and, with that, would not need to conduct an Indigenous Consultation. The case shows that the Environmental Impact

Assessment focuses on compliance with environmental quality standards while pushing aside intangible cultural and spiritual aspects.

Regarding the Director of Villarrica's Historical and Heritage Corporation's suggestion to create Historical Heritage Registries for the Region to validate the information presented by project owners, recent Chilean studies confirm the importance of protecting spaces of significance for the indigenous population in national urban and peri-urban areas (Fontana, 2022; Olate Michel, 2024). The co-creation of registries, as exemplified by Colombia's Multipurpose Land Registry, could serve as a regional information tool to reduce the structural power gap in the planning and regulation of Chilean urban development between project owners and indigenous communities. A first step in this direction was recently taken in the context of the modification of the Concepción Metropolitan Regulatory Plan with the publication of the protocol on including indigenous peoples in planning matters by the SEREMI MINVU Biobío (Trawün in Concepción: State and Mapuche People co-build metropolitan urban planning, 2025) and of a first mapping effort that included 395 sites of Mapuche-lavkenche cultural significance in the Metropolitan Area (Gore Biobío & Minvu, 2025).

VI. CONCLUSIONS

This research aimed to analyze a case of urban development in the peri-urban area of Villarrica to better understand the relationship between urban planning and spaces of cultural significance for indigenous peoples, particularly in relation to urban development regulations. The key is recognizing Environmental Impact Assessment as the only way to consult indigenous peoples for an urban development project. In this vein, there are structural limitations, such as restrictions on Environmental Impact Statements and insufficient deadlines, that do not allow for effective public participation. The research reveals a lack of a rigorous intercultural approach and administrative obstacles to effective participation, coupled with a technical vision that minimizes cultural and spiritual dimensions, thereby restricting the ability of the SEIA and, therefore, of urban development regulation, to address impacts comprehensively.

The discussion presented here demonstrates that the urban development regulations in Chile fail to adequately address essential issues concerning the State's obligations to indigenous peoples. It is necessary to make structural regulatory adjustments to the approval process for urban development projects to better protect sites of significance to indigenous peoples within Chilean urban areas, recognizing their status as peoples rather than treating them as just another stakeholder in urban planning.

VII. CONTRIBUTION OF AUTHORS CREDIT:

Conceptualization, I.F., M.C.; Data curation, I.F.; Formal analysis, I.F.; Acquisition of financing, M.C.; Research, I.F.; Methodology, I.F., M.C.; Project management, I.F.; Resources; Software; Supervision, M.C.; Validation; Visualization, I.F.; Writing - original draft, I.F.; Writing - revision and editing, M.C.

VIII. BIBLIOGRAPHIC REFERENCES

- Aguilera, M. (2022). Antecedentes etnográficos e históricos de la Retxikura del Mallowelafkén y área de interés cultural Pampa Iribarren en M. Aguilera Oliva y C. B. Mahi (Edr.) *Patrimonio Lacustre. Boletín temático de la Corporación Histórica Patrimonial de Villarrica*. RETXIKURA. Monumento Nacional y Zona Arqueológica Protegida. Corporación Histórica Patrimonial de Villarrica. <https://es.scribd.com/document/814233725/PATRIMONIO-LACUSTRE-VILLARRICA>
- Agüero, S., Altman, D., & Salas, V. (2014). Municipalidades, ciudadanos y democracia directa en Chile: esbozos de una relación fluida en A. Lissidini, Y. Welp, y D. Zovatto (Cds.) *Democracias en movimientos. Mecanismo de democracia directa y participativa en América Latina*. Instituto de Investigaciones Jurídicas, UNAM. <https://repositorio.unam.mx/contenidos/5015720>
- Barría Meneses, J. A. (2019). La consulta indígena en la institucionalidad ambiental de Chile: Consecuencias para la minería y las comunidades indígenas Collas de la Región de Atacama. *Investigaciones Geográficas: Una Mirada Desde El Sur*, (57). <https://doi.org/10.5354/0719-5370.2019.53490>
- Carmona Caldera, C. (2020). Evaluación ambiental, consulta indígena y el "desplazamiento" de los derechos de los pueblos indígenas. *Revista De Derecho Universidad De Concepción*, 88(248), 199-232. <https://doi.org/10.29393/RD248-17EACC10017>
- Caulkins, M. W (2020). Aprobación del Plan Regulador Comunal de Ñuñoa a través del uso creativo de la normativa. *URBE. Arquitectura, Ciudad y Territorio*, (10), 19-26. <https://doi.org/10.29393/UR10-2APMC10002>
- Caulkins, M., Choque-Caseres, D., & Alarcón-González, M. V. (2023). Explorando la relación entre planificación urbana y Pueblos Indígenas en áreas urbanas chilenas. *Revista EURE - Revista De Estudios Urbano Regionales*, 49(148). <https://doi.org/10.7764/EURE.49.148.01>
- Coulthard, G. S. (2014). *Red skin, white masks: Rejecting the colonial politics of recognition*. University of Minnesota Press
- Decreto 40 de 2012 [Ministerio del Medio Ambiente]. Aprueba reglamento del Sistema de Evaluación de Impacto Ambiental. 12 de agosto de 2013. <https://bcn.cl/2eq73>
- Decreto 66 de 2014 [Ministerio de Desarrollo Social]. Aprueba reglamento que regula el procedimiento de Consulta Indígena en virtud del artículo 6 N° 1 letra a) y N° 2 del Convenio 169 de la Organización Internacional del Trabajo y deroga normativa que indica. 15 de noviembre de 2013. <https://bcn.cl/253ep>
- Decreto 236 de 2008 [Ministerio De Relaciones Exteriores]. Promulga el Convenio N° 169 sobre Pueblos Indígenas y Tribales en países Independientes de la Organización Internacional del Trabajo. 2 de octubre de 2008. <https://bcn.cl/2fx8e>
- Faúndes Peñafiel, J. J., & Campos Mello, P. P. (2024). Propuesta hermenéutica, precautoria-ambiental-intercultural, en la evaluación ambiental de proyectos de inversión y comunidades indígenas en Chile. *Revista Chilena de Derecho & Ciencia Política*, 15(1), 1-32. <https://doi.org/10.7770/rchdcp-v15n1-art391>
- Fontana, M. (2022). Wariatun, espacialidades mapuche en la metrópoli neoliberal. La producción de la otredad en el espacio en M. Caulkins, C. Cornejo-Nieto, M. Fontana, Y. Herrera, D. Benavente, & S. Vergara (Eds.), *Descolonizando territorios urbanos: de la planificación colonial a las respuestas desde la interculturalidad crítica* (pp. 111-132).

Universidad de Concepción.

Fuenzalida, S. (2015). Desarrollo de la jurisprudencia en Chile sobre la consulta indígena: los casos del tribunal constitucional y la corte suprema. *Revue québécoise de droit international*, H-S(1), 149-177. https://www.persee.fr/doc/rqdi_0828-9999_2015_hos_1_1_2105

Gobierno de Colombia. (28 de abril de 2025). *Gobierno Nacional les cumple a los pueblos indígenas con la aprobación del decreto para la gestión catastral multipropósito en sus territorios*. Gov.co. <https://www.igac.gov.co/noticias/gobierno-nacional-les-cumple-los-pueblos-indigenas-con-la-aprobacion-del-decreto-para-la-gestion-catastral-multiproposito-en-sus-territorios>

Gore Biobío. (21 de marzo de 2022). *Contraloría rechazó el plan regulador para el Gran Concepción*. Radio UdeC 95.1. <https://www.radioudec.cl/contraloria-rechazo-el-plan-regulador-para-el-gran-concepcion/>

Gore Biobío y Minvu (2025). *Trokiñ Mogen: Espacios de Significación Cultural Indígena en la provincia de Concepción*. Minvu y Gore Biobío.

Herrera Amaya, M. E. (2018). Comunidades indígenas urbanas: disputas y negociación por el reconocimiento. *Andamios, Revista De Investigación Social*, 15(36), 113-134. <https://doi.org/10.29092/uacm.v15i36.604>

Imilan, W., Mansilla-Quiriones, P., Lemun, V., Cuyanao/Waikil, J., & Millaleo, A., (2023). Coexistencia de urbanidades más allá de la planificación moderna. Resistencias y disputas mapuche en la Araucanía urbana. *Revista INVI*, 38(108), 75-98. <https://doi.org/10.5354/0718-8358.2023.69889>

Kramer Grand, J. (2019). *La construcción social de riesgo en Quebradas del Pie de Monte al Nor-Oriente del Área Metropolitana de Santiago: comuna de Lo Barnechea* [Tesis de Magister, Pontificia Universidad Católica de Chile]. Repositorio UC. <https://repositorio.uc.cl/dspace/items/e1cd9410-cc60-4a46-8061-ffea91bceb37/full>

Mansilla Quiriones, P., & Imilan Ojeda, W. (2020). Colonialidad del poder, desarrollo urbano y desposesión mapuche: urbanización de tierras mapuche en la Araucanía chilena. *Scripta Nova. Revista Electrónica de Geografía y Ciencias Sociales*, 24, 630. <https://doi.org/10.1344/sn2020.24.21225>

Ley 19.253 de 1993. Establece normas sobre protección, fomento y desarrollo de los indígenas, y crea la Corporación Nacional de Desarrollo Indígena. 28 de septiembre de 1993. D. O. N° 34.683.

Ley 19.300 de 1994. Aprueba ley sobre bases generales del medio ambiente. 9 de marzo de 1994. D. O. N° 34.810.

Ley 20.500 de 2011. Sobre asociaciones y participación ciudadana en la gestión pública. 4 de febrero de 2011. D. O. N° 39.887.

Núñez, A., Riquelme Maulén, W., Salazar, G., Maturana, F., & Morales, M. (2022). Dinámicas urbanas en territorio indígena: transformación en las formas de habitar mapuche en el lof Rengalil, Labranza (región de la Araucanía, Chile). *Revista de Estudios Sociales*, 1(80), 75-96. <https://doi.org/10.7440/res80.2022.05>

Olate Michel, C. I. (2024). *Espacios de significancia cultural Lafkenche en la comuna de Puerto Saavedra. Lineamientos para la integración de espacios de valor cultural Mapuche Lafkenche en la planificación territorial* [Tesis de Magister, Universidad de Concepción]. Repositorio UdeC. <https://repositorio.udec.cl/handle/11594/12664>

Oyarce Avilés, C. (2020). *Periurbanización y amenazas del paisaje lacustre: hacia nuevos pasajes-paisajes de desarrollo sostenible en la conurbación Villarrica-Pucón* [Tesis de Magister, Pontificia Universidad Católica de Chile]. Repositorio UC. <https://doi.org/10.7764/tesisUC/ARQ/62965>

Parraguez Sanchez, L. (2012). La reconstrucción de movimiento social en barrios críticos: El caso de la "Coordinadora de Pobladores José María Caro" de Santiago de Chile. *Revista INVI*, 27(74), 217-246. <https://revistainvi.uchile.cl/index.php/INVI/article/view/62429>

Porter, L., & Barry, J. (2016). *Planning for Coexistence? Recognizing Indigenous rights through land-use planning in Canada and Australia*. Routledge.

Prada-Trigo, J., Aravena, N., & Barra, P. (2021). Urban growth and indigenous land. Real estate strategies and urban dynamics in Temuco (Chile). *Geografiska Annaler: Series B, Human Geography*, 103(2), 133-151. <https://doi.org/10.1080/04353684.2021.1921602>

Rojo-Mendoza, F., Salinas-Silva, C., & Alvarado-Peterson, V. (2022). The end of indigenous territory? Projected counterurbanization in rural protected indigenous areas in Temuco, Chile. *Geoforum*, 133, 66-78. <https://doi.org/10.1016/j.geoforum.2022.05.012>

Sánchez Curihuentro, J. (2001). El Az Mapu o sistema jurídico mapuche. *CREA*, (2), 28-39. <https://repositoriodigital.uct.cl/handle/10925/886>

Schuster-Olbrich, J. P., Vich, G., & Miralles-Guasch, C. (2024). Expansión urbana más allá del límite urbano: un análisis de Santiago de Chile desde la planificación urbana y sus contradicciones normativas territoriales. *Revista EURE - Revista De Estudios Urbano Regionales*, 50(150), 1-22. <https://doi.org/10.7764/EURE.50.150.08>

Servicio de Evaluación Ambiental [SEA]. (2024). *Ficha del Proyecto: Proyecto Inmobiliario Lomas del Lago Villarrica*. Sistema de Evaluación de Impacto Ambiental. https://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=normal&id_expediente=2161918957

Servicio De Evaluación Ambiental [SEA]. (2026). *Información de Proyectos Ingresados al SEIA*. <https://www.sea.gob.cl/documentacion/reports/informacion-de-proyectos-ingresados-al-seia#:~:text=Informaci%C3%B3n%20de%20Proyectos%20Ingresados%20al%20SEIA>

Sierra, L. (2006). Urbanismo por decreto: centralismo y confusión institucional en la ciudad chilena en A. Galetovic (Ed.), *Santiago. ¿Dónde estamos y hacia dónde vamos* (pp. 299-328). Centro de Estudios Públicos (CEP). https://static.cepchile.cl/uploads/cepchile/2022/09/libro_santiago_version_en_baja.pdf

Trawün En Concepción: Estado Y Pueblo Mapuche Co-Construyen Planificación Urbana Metropolitana. (27 de julio de 2025). Bionoticias.cl Regional. <https://bionoticias.cl/trawun-en-concepcion-estado-y-pueblo-mapuche-co-construyen-planificacion-urbana-metropolitana/>

Ugarte Urzua, M. (2019). *Normative worlds clashing: state planning, Indigenous self-determination, and the possibilities of legal pluralism in Chile* [Tesis de Doctorado, University of British Columbia Vancouver]. Library UBC. <https://dx.doi.org/10.14288/1.0377642>

Ugarte, M., Fontana, M., & Caulkins, M. (2019). Urbanisation and Indigenous dispossession: rethinking the spatio-legal imaginary in Chile vis-à-vis the Mapuche nation. *Settler Colonial Studies*, 9(2), 187-206. <https://doi.org/10.1080/2201473X.2017.1409397>

Vicuña Del Río, M. (2013). El marco regulatorio en el contexto de la gestión empresarialista y la mercantilización del desarrollo urbano del Gran Santiago, Chile. *Revista INVI*, 28(78), 181-219. <https://revistainvi.uchile.cl/index.php/INVI/article/view/62532>

Zunino, H. M., Hidalgo Dattwyler, R. A., & Marquardt Zapata, E. (2011). Vivienda social y segregación espacial en la Ciudad de Pucón, Chile: entre el enclaustramiento y la integración con el hábitat turístico. *Revista INVI*, 26(71), 15-55. <https://revistainvi.uchile.cl/index.php/INVI/article/view/62334>

IX. ACKNOWLEDGMENTS

Both authors are grateful to ANID for funding under the Fondecyt Iniciación 11241033 project.

Ignacio Felis thanks the communities and interviewees for their trust, his colleagues at his faculty for their academic rigor, and, especially, his family for their unconditional support throughout this process.

TIPOLOGIES OF URBAN RAVINES FOR ADAPTIVE PLANNING TO CLIMATE CHANGE IN LOJA, ECUADOR ¹

TIPOLOGÍAS DE QUEBRADAS URBANAS PARA LA PLANIFICACIÓN ADAPTATIVA AL
CAMBIO CLIMÁTICO EN LOJA, ECUADOR

CLAUDIA SALOMÉ GONZÁLEZ-ROLDÁN ²
MERCEDES DEL CISNE TORRES-GUTIÉRREZ ³
FABIÁN RENÉ REYES-BUENO ⁴
GALINA MERCEDES SEGARRA-MORALES ⁵

- 1 Artículo financiado por Consultoría: Cooperación Técnica Alemana GIZ "Diseño de un plan de intervención en tres quebradas de la ciudad de Loja para la gestión del riesgo y adaptación al cambio climático" [PROY_CONS_AU_2022_3344]
- 2 Magister en Diseño urbano y planificación urbana
Directora de la Carrera de Arquitectura, Facultad de Ingenierías y Arquitectura
Universidad Técnica Particular de Loja, Loja, Ecuador
<https://orcid.org/0000-0001-6011-0410>
csgonzalez@utpl.edu.ec
- 3 Magister en Ordenación del Territorio
Directora del Programa en Planificación del Territorio, Facultad de Ingenierías y Arquitectura
Universidad Técnica Particular de Loja, Loja, Ecuador
<https://orcid.org/0000-0001-9113-4060>
mctorres27@utpl.edu.ec
- 4 Doctor en Ingeniería para el Desarrollo Rural
Director del Departamento de Ciencias Biológicas y Agropecuarias, Facultad Ciencias Exactas y Naturales
Universidad Técnica Particular de Loja, Loja, Ecuador
<https://orcid.org/0000-0002-5646-0263>
frreyes@utpl.edu.ec
- 5 Magister en Rehabilitación Urbana y Arquitectónica
Docente del Departamento de Ingeniería Civil, Arquitectura y Geociencias,
Facultad de Ingenierías y Arquitectura
Universidad Técnica Particular de Loja, Loja, Ecuador
<https://orcid.org/0000-0003-1652-6923>
gmsegarra2@utpl.edu.ec

<https://doi.org/10.22320/07183607.2026.29.53.04>



Con las civilizaciones, el agua y su geografía marcaron patrones para construir redes urbanas como insumo de vida, producción de alimentos, transporte e identidad colectiva; sin embargo, en la actualidad estas redes azules han sido excluidas frente al proceso de urbanización, lo que ha llevado a su pérdida parcial o total por cambios de uso de suelo y ocupación indebida, lo que potencia amenazas y disminuye la capacidad de adaptación al cambio climático. Esta realidad se redibuja en Loja, ciudad andina del sur de Ecuador, atravesada por tres ríos y 44 quebradas, en un relieve irregular, donde la investigación buscó identificar y delimitar tipologías de quebradas que definan lineamientos para su planificación, con un enfoque urbano-ambiental adaptativo al cambio climático. La metodología se estructuró en dos fases: en la primera, a partir de información cartográfica, se identificaron y normalizaron seis variables que inciden en la adaptación urbana: movimientos en masa, sobreutilización, bosques y plantaciones, alcantarillado, consolidación urbana e índice de contaminación potencial difusa. En la segunda, con la participación de expertos y mediante el Proceso Analítico Jerárquico, se definieron las variables y pesos a considerar para evaluar la capacidad adaptativa de quebradas frente al cambio climático y, con ello, definir tipologías. Como resultado, se obtuvieron seis tipologías de quebradas urbanas, estableciéndose que el mayor número corresponde a “Riesgo Bajo - Cobertura Bajo - Infraestructura Medio”. Como variables decisivas al momento de priorizar quebradas, a criterio de los expertos, se consideraron movimientos en masa, bosques y plantaciones, y sobreutilización del suelo.

Palabras clave: aguas superficiales, tipología, planificación territorial, cambio climático

Across civilizations, water and geography shaped patterns in building urban networks, serving as inputs for life, food production, transportation, and collective identity. However, nowadays these blue networks have been excluded amid urbanization, leading to their partial or total loss due to changes in land use and improper occupation, which heightens threats and reduces the ability to adapt to climate change. This reality is redrawn in Loja, an Andean city in southern Ecuador, crossed by three rivers and 44 ravines in an irregular relief, where the research sought to identify and delimit ravine typologies to define planning guidelines using an urban-environmental approach adapted to climate change. The methodology was structured in two phases: in the first, based on cartographic information, six variables affecting urban adaptation were identified and normalized: landslides, overuse, forests and plantations, sewerage, urban consolidation, and the diffuse potential pollution index. In the second, with the participation of experts and through the Hierarchical Analytical Process, the variables and weights to be considered for evaluating the adaptive capacity of ravines in the face of climate change were defined, and, as a result, typologies were established. Thus, six urban ravine typologies were identified, with the largest group being “Low Risk - Low Coverage - Medium Infrastructure.” According to the experts, the decisive variables for prioritizing ravines were landslides, forests and plantations, and land overuse.

Keywords: surface waters, typology, territorial planning, climate change

I. INTRODUCTION

The effects of Climate Change, from now on CC, have repercussions on regional systems, evidencing that human activities and rapid urbanization contribute to the generation of greenhouse gases and the loss of permeable soils (Arellano & Roca, 2015). The replacement of natural drainage networks with impermeable surfaces increases runoff and flood risks (Vidal & Romero Aravena, 2010). As a result, strategic ecosystems, such as riverbanks, have been invaded for construction (Guastella et al., 2019), thereby reducing resilience to natural hazards.

In Latin America, several studies have addressed blue networks from specific approaches. It has been shown how urbanization in Andean basins severely alters the hydro-geomorphological balance of a region (Romero & Vásquez, 2005). From an ecosystem services perspective, the role of riparian areas as buffer zones is particularly evident in Santiago's Mapocho River (Vásquez, 2016). In the dense Buenos Aires context, Green-Blue Infrastructure [GBI] generates environmental, social, and economic benefits (Kozak et al., 2020), while in Quito (Secretariat of the Environment, 2025), the micro-watershed approach is incorporated into analyses of land-use protection, risk, and CC. This shows regional progress, but also the need for comprehensive approaches to characterize and organize urban ravines based on their adaptive capacity to CC at the intra-urban scale.

In this framework, this research is carried out in Loja, an Andean city in southern Ecuador, whose water system evidences the persistent impact of urban growth on its water courses (Municipality of Loja, 2021). The study sought to define typologies of resilient ravines, identify which variables are relevant to defining urban ravine typologies for adaptive intervention to CC, and assess the distribution and prevalence of these typologies in the case study. A methodology was proposed to standardize the variables affecting urban adaptation to CC, and, at the same time, establish, with the participation of experts on the subject and using the Analytical Hierarchy Process [AHP], the variables and weights that define the urban ravine typologies. The study's contribution is to support planning decision-making by identifying intervention priorities and differentiated levels of adaptive capacity in Andean urban contexts.

II. THEORETICAL FRAMEWORK

Adaptive planning in urban water systems has attracted growing scientific interest in addressing the impacts of CC (Rangwala, 2024). Regional planning is no longer limited to reducing risks or vulnerability, but includes various components of the socio-ecological system (Gallopin, 2003). In this regard, this explains how current cities are generating a negative metabolic

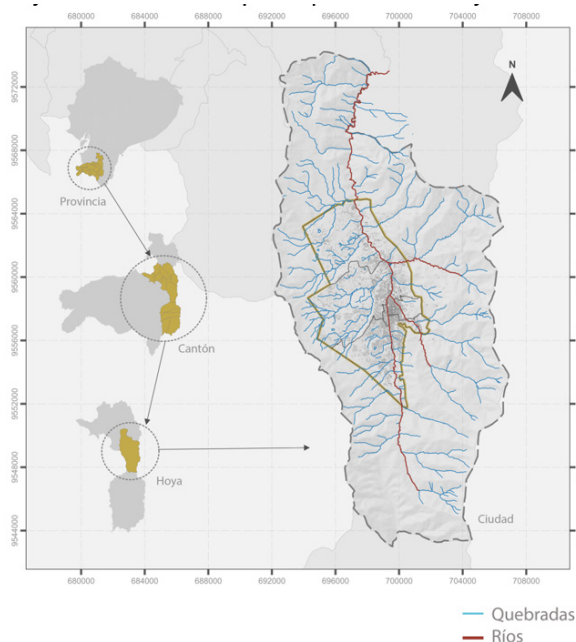


Figure 1. Case study: City of Loja. Source: Preparation by the authors.

process that accelerates as the urban sprawl spreads, without considering sustainable infrastructure (Delgado Ramos, 2014); therefore, it is imperative to approach CC from the region's multidimensional planning (Barton, 2009), as the climate and its effects are understood from the relationship between the natural environment and human beings.

Among the effects of CC, increases in rainfall frequency and intensity are evident (IPCC, 2023); hence, the sponge city model emerges as the dominant urban drainage strategy. This model absorbs rainwater and allows it to follow its natural course, avoiding the collapse of gray systems (Jiang & McBean, 2021) by optimizing the principles of natural accumulation, filtration, and purification (Yu et al., 2023). GBI is fundamental to this model because it provides thermal control, improves air quality, and manages floods (Venkataramanan et al., 2020). As for urban ravines, given their socio-ecological value, they have high potential to form this GBI (Sánchez-Almodóvar et al., 2023).

Beyond physical infrastructure, contemporary urban watershed planning incorporates resilience and adaptive capacity. Adaptive capacity is understood as the ability of a system (in this case, the ravine and its surroundings) to adjust to climatic changes, moderate potential damage, and leverage opportunities (Valera & Sharifi, 2025). In the Latin American context, this capacity directly depends on the quality of the available GBI, in which riparian vegetation not only regulates the hydrological cycle and temperature but also provides multifunctional support

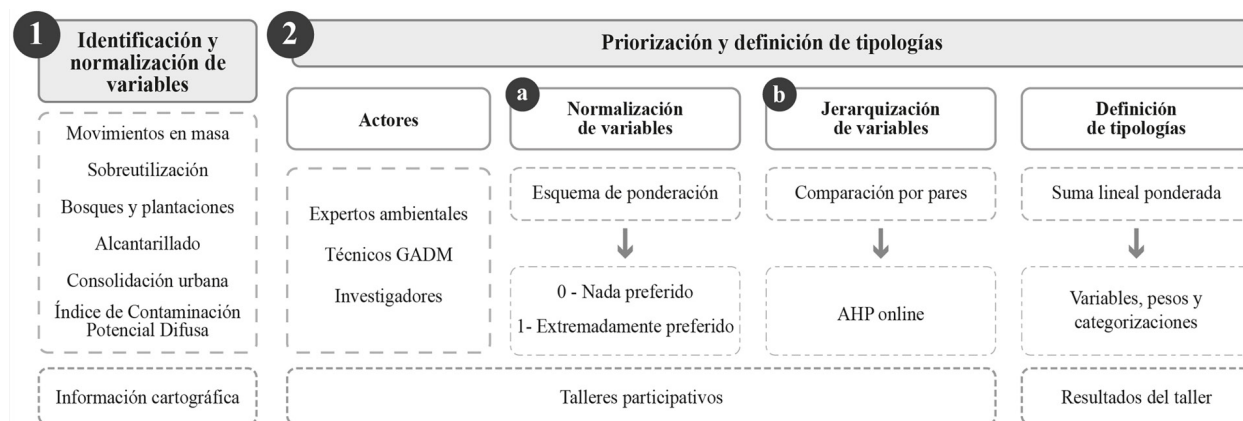


Figure 2. Methodological process of the research. Source: Preparation by the authors.

for ecological and social connectivity (Pradilla & Hack, 2024). Therefore, the characterization of ravines must not be limited to describing physical states, but rather it must interpret the interaction between the threat (risk) and the response capacity of the ecosystem (coverage) and society (infrastructure) to determine its real adaptation potential in the face of extreme events (Valera & Sharifi, 2025).

On the other hand, AHP has proven valuable for decision-making in regional planning under climate uncertainty, where multiple social, environmental, and economic objectives converge. Bousquet et al. (2023) identified AHP as one of the most widely used methods for planning nature-based solutions, in which experts participate in the criteria-weighting phase, and Geographic Information Systems (GIS) tools are used. Meerow and Newell (2017) developed the Green Infrastructure Spatial Planning model, which combines GIS-based multicriteria analysis with six benefit criteria and demonstrates the effectiveness of AHP in planning by relating spatial aspects to ecosystem services. At the same time, Kaur and Gupta (2022) proposed GBI using AHP-GIS for climate-adaptation-focused rainwater management.

III. CASE STUDY

The city of Loja, in southern Andean Ecuador's Loja province, was selected as a case study. It has 203,496 inhabitants (National Institute of Statistics and Censuses [INEC], 2022) spread over 5,732.51 hectares (Municipality of Loja, 2021). Figure 1 shows the location of the city in the context of the basin, canton, and province of Loja, as well as the water system consisting of three rivers and 44 ravines in an irregular relief. The rivers run for about 21.53 km, while the ravines run for about 104.34 km.

IV. METHODOLOGY

The research used a mixed-methods approach integrating quantitative spatial analysis and multicriteria decision-making methods. The process was developed in two phases: 1) identification and standardization of variables, and 2) prioritization and definition of typologies. The AHP method (Saaty, 1990) was used through participatory workshops and GIS for cartographic analysis (Figure 2).

Phase 1: Identification and standardization of variables

The six variables were grouped into three categories: risks, coverage, and infrastructure, according to complementary territorial analysis dimensions that evaluate ravine functionality and vulnerability (Canteiro et al., 2024; Li et al., 2022; Fu et al., 2021) in a previously obtained 200 m buffer. This buffer is justified because riparian zones are critical interfaces between terrestrial and aquatic systems, whose ecological and hydrological processes depend on the surrounding landscape, not only on the immediate water course (Gregory et al., 1991; Kupilas et al., 2021). The buffer considers the influence of the built environment, is consistent with zoning methodologies for water threats in Andean basins (Montenegro & Arteta, 2019), and aligns with buffer criteria required for ecological connectivity in Latin American cities (Pradilla & Hack, 2024).

Group 1. Risks - Dimension of natural threats

This focused on the region's intrinsic geomorphological hazards, incorporating susceptibility mapping to landslides that compromise soil stability. Landslide mapping (2008) of the Loja Municipal GAD was used, selecting 'Very high' and 'High' risks. The inclusion of both variables is critical, given that CC scenarios foresee intensified rainfall in the Andean region, which directly triggers landslides on unstable slopes, endangering the viability of gray infrastructure and necessitating preventive adaptation

measures (Alzate Buitrago, 2021). The representative percentage of these risks in each ravine was determined.

Group 2. Coverage - Ecological status dimension

The ecosystem's biophysical conditions were considered, including the integrity of the vegetation cover and the region's support capacity (overuse). Random Forest algorithms were used in the Google Earth Search Engine to perform a supervised classification of a PlanetScope image (3 m spatial resolution). The Standardized Difference Vegetation Index was used to spectrally discriminate between consolidated arboreal vegetation (forests/ plantations) and low-growing vegetation (shrub/herbaceous). Overuse was determined by evaluating land use conflicts. First, the host capacity of the environmental units (defined by land use, permeability, and slope) was calculated using an impact-aptitude matrix against potential activities ('Agriculture', 'Conservation' and 'Regeneration'). By comparing this capacity with the actual ground cover, four levels of conflict were identified and quantified (in area and percentage within the buffer): adequately used, light overuse, medium overuse, and light underuse.

Group 3. Infrastructure - Anthropic pressure dimension

The human interventions that modify the natural dynamics of the ravines were analyzed. The percentage of homes without sewerage was determined using information from the Sewer Network and Loja's Land Registry. An 'Intersection' was made between the houses and the buffer. The 'Connection by proximity' tool was used, taking into account that the distance is greater than or equal to 0, to determine the houses with sewerage at that distance. Urban consolidation was defined using the city's land registry mapping, in which the percentage of land with construction was estimated. The ICPD was calculated by cross-referencing data on land use, permeability, slope, and flow length to determine its average for each ravine.

Phase 2: Prioritization and definition of typologies

On May 31st, 2022, a multidisciplinary participatory workshop was held, involving stakeholders with technical, regulatory, and regional knowledge of the Loja basin. The expert panel comprised three strategic groups:

1. Local government technical experts: representatives of the Municipality of Loja with experience in regional management, sewerage, and urban planning.
2. Environmental experts: engineers and specialists with expertise in hydrological dynamics, vegetation cover, and climate risks.
3. Consulting team and researchers: academics in charge of methodological structuring and the spatial analysis of variables.

This workshop had two stages. The preparatory stage, in which the preliminary list of variables selected from the existing literature, expert knowledge, and field observations

was presented. A weighting outline was used; the group of experts established standardized values for the variables based on preferences (0 for not preferred at all and 1 for extremely preferred). To avoid arbitrary weighting of variables, the Analytical Hierarchy Process (AHP) was applied with the expert panel using the AHP Online tool (Goepel, 2018).

Weighted linear sum of typologies

A weighted linear sum was used to generate typologies, incorporating the variables and weights defined in the workshop, as well as the categorizations among them. The values (0 to 1) were standardized for the 200 m buffers of the 44 ravines. The results were classified as 'low' for those who scored between 0 and 0.33, 'medium' for those who scored between 0.34 and 0.66, and 'high' for those who scored between 0.67 and 1.

V. RESULTS

Characterization of ravines

Prior to the characterization, the ravine system was organized, labeling those not identified by the Municipality of Loja. It was possible to identify 44 ravines within the city's urban limits. Next, the results of the risk, coverage, and infrastructure analyses are presented, which allow defining homogeneous zones based on similarities in their biotic and physical components. Figure 3 shows that 4 ravines have between 20-30% of their area at 'very high' risk, 45% of the total, and 13 between 10-20% corresponding to 36%; while 12 ravines have between 15-30% of their area at 'high' risk, 55% of the total, and 26 of the 0-15% grouping in 21%.

The overuse analysis indicates that the buffer area has 57.9% adequate use, 27.8% light overuse, 13.9% medium overuse, and 0.4% light underuse. On the other hand, seven ravines have forest cover on more than 20% of their surface area, accounting for 31% of the total buffer area (Figure 4).

Figure 5 shows that 33% of homes in the buffer zone lack a sewer system; 19 ravines have fewer than 50% of their homes with the service. 11 ravines have a high degree of consolidation (more than 75% of plots built), representing 27% of smallholdings in the buffer. The ICPD ranges from 5.25 to 7.85, with the majority of the region (78%) showing medium to high values and 14% very high values.

Prioritization and weights of each factor

With the weighting conducted in the expert workshop, the variables are grouped into three categories: risks, coverage, and infrastructure. According to Table 1, at the global level, the variable landslides (high and very high risk) have the greatest influence in identifying the ravines to be intervened, followed by

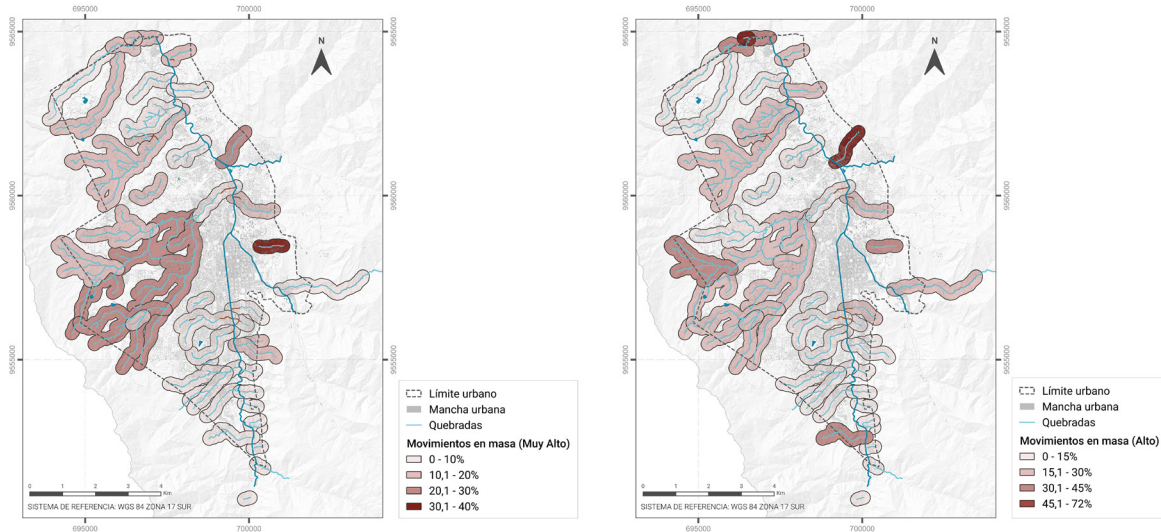


Figure 3. 'Very High' and 'High' landslides. Source: Prepared by the Authors based on GAD Municipal de Loja - Landslides (2008).

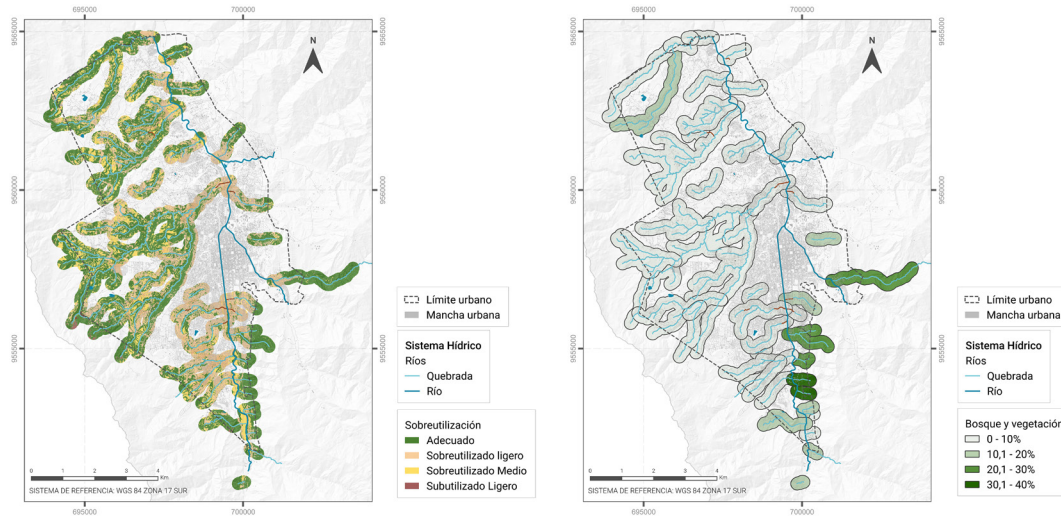


Figure 4. Overuse, forests, and plantations. Source: Preparation by the authors.

those with smaller forest and plantation areas and land overuse. A third minor group includes urban consolidation, ICPD, sewerage, shrubs, and grass, according to the key stakeholders' criteria.

Types of ravines

Next, the six types of urban ravines are described, represented in Figure 6 and detailed in Complementary Table 1 (Table C1). Both the categorized and interpretative typology related to its capacity to adapt to CC are presented.

- 'High risk, low coverage, medium infrastructure' – 'ravines with very low adaptive capacity': Four (10.5% of the system) are located on steep slopes, with high risk due to landslides, soil instability, mudslides, and floods. The vegetation cover is low due to the shift to agricultural and livestock uses in its protected areas. They are mostly confined to sectors of low urban consolidation.
- 'Medium risk, low coverage, medium infrastructure' - 'ravines with low adaptive capacity': 11 (43.5% of the

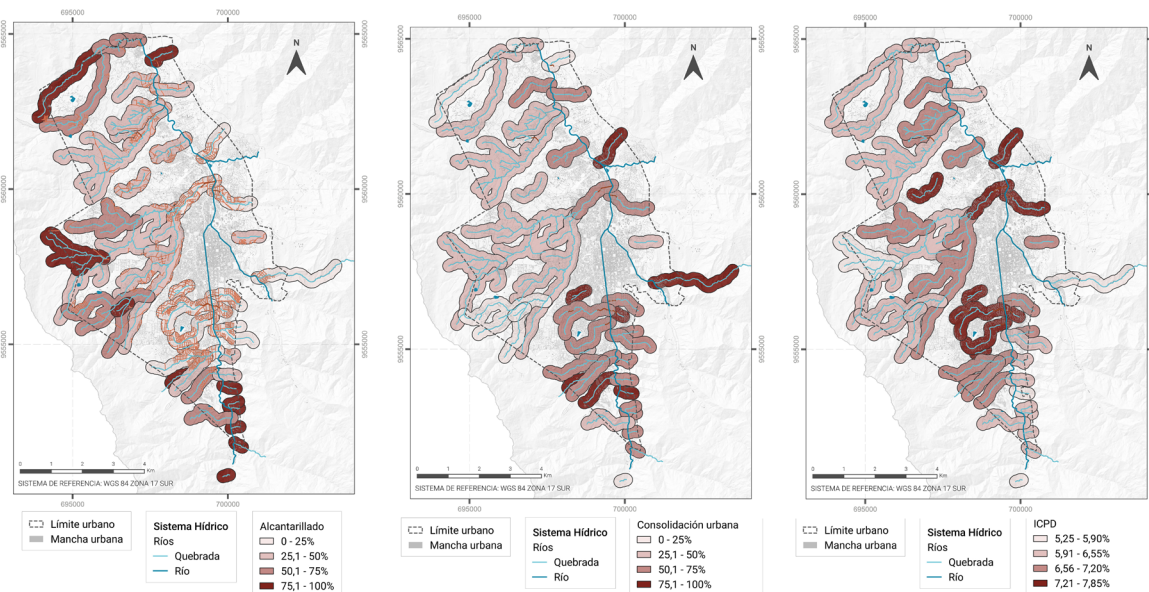


Figure 5. Sewerage, urban consolidation, and ICPD. Source: Prepared by the Authors.

Category	Weight (%)	Variable	Weight (%)	Factor
Risks	27	Landslides	27	1
Coverage	47	Forests and plantations	21	0.44
		Overuse	19	0.40
		Shrubs and grass	7	0.16
Infrastructure	26	Urban consolidation	10	0.38
		ICPD	8	0.32
		Sewerage	8	0.30

Table 1. Hierarchy of variables. Source: Preparation by the authors.

- system), located towards the west of the medium urban consolidation area. Low forest and native flora cover have been affected by urbanization. At the same time, important stretches of ravines that have been dammed up affect water ecosystems and vegetation. The average sewer coverage pollutes the water and its protective edges.
- 'Low risk, low coverage, high infrastructure' - 'ravines with conditional adaptation potential': Seven (9.5% of the system) are concentrated in the south west and run through the foothills with forests and native vegetation, being potential resources for water catchments. The low levels of sanitary infrastructure have a high and direct effect on the ravines.
- 'Low risk, low coverage, medium infrastructure' - 'ravines with adaptive capacity restricted by urban consolidation': 19 (34.8% of the system). They cover a large part of the city's consolidated area, so important sections have been channeled and buried, thereby modifying their natural routes and conditions. Consequently, they have low vegetation cover, land-use changes, and a lack of buffer zones, which pose direct risks to the surrounding inhabitants.
- 'Low risk, medium coverage, high infrastructure' - 'ravines with severely limited adaptive capacity': One (0.5% of the system) located towards the south center, whose natural characteristics were almost completely modified with the channelization and burial of its course. The presence of

neighborhoods without sewerage generates pollution and high alterations to natural ecosystems.

- 'Low risk, medium coverage, medium infrastructure' - 'ravines with intermediate adaptation': Three (1.2% of the system) are located towards the city center with characteristics of dominant urban consolidation. The presence of vegetation is average, and despite their location, they maintain protected areas that support regular vegetation and shrub cover, making it possible to restore and enhance them.

VI. DISCUSSION

The results showed that for the prioritization of the ravines to be intervened, the predominant influence of the landslides, forests and plantations variables, as well as land overuse stand out, all related to the importance of maintaining the permeability of vegetation cover on the edges of the ravines, as these green spaces along urban waterways could, among other benefits, moderate the impacts of urban heat islands, strengthen flood resilience and improve air quality (Inançoğlu et al., 2020).

The combination of variables and categories generated six types of ravines, whose interpretation of risk conditions, the state of ecosystem components, and the degree of urban transformation underpins their adaptive capacity to CC (Nieto-Cañarte et al., 2025; Ferrario et al., 2024). Two typologies stand out: ravines with very low adaptive capacity, which are the most critical and include four ravines, and ravines with low adaptive capacity, which include 11 ravines; in addition, due to the length of their course, they represent 54% of the system. This shows that the planning and recovery of ravines requires increasing vegetation cover and promoting appropriate land use, as well as going beyond gray engineering approaches that have also caused total deforestation of the alluvial riverine plains by nature-based solutions, which allow including the influence of vegetation and resilience in flood-prone areas (Vörösmarty et al., 2018). Moving from a vertical strategy to a more horizontal-natural approach that leaves room for the waterbody in the city (Warner et al., 2012) that promotes the restoration of spaces for floodplains and river channels to remain active and as free as possible, and the connectivity between the main stream of the river and the floodplain to generate self-sustaining ecosystems (Zingraff-Hamed et al., 2021), which should be considered in urban planning and in the regulation of the use and occupation of the city's land from a socio-ecological perspective.

On the other hand, the use of the AHP and the participation of experts and key actors in the prioritization of variables for decision-making is fundamental because it contributes to the knowledge of reality in participatory workshops in a structured and mathematical framework for multicriteria decision-making, which allows identifying and hierarchizing fundamental aspects (Pérez-Ramírez & Martínez-Damián, 2020). In addition,

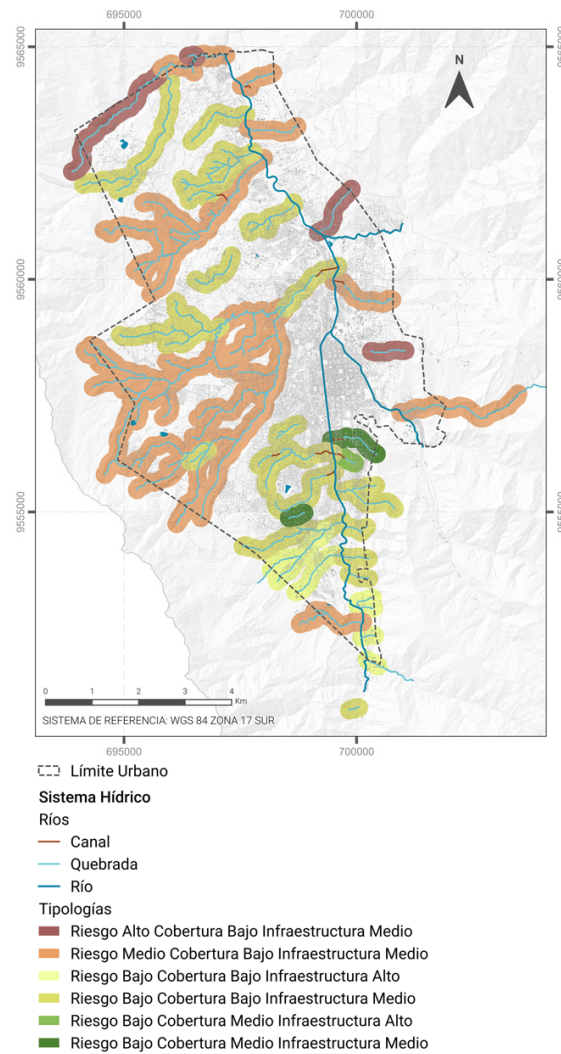


Figure 6. Typologies of the urban ravines of Loja. Source: Preparation by the authors.

its transparency can help manage tensions and conflicts of interest that may arise between different groups (Baladia et al., 2015). However, the AHP may introduce sources of bias, primarily stemming from the subjectivity of experts in paired comparisons, which can be influenced by leadership, consensus pressures, or power imbalances. In addition, the method assumes independence among criteria and may be sensitive to small variations in assessments (Mendoza et al., 2019). In this study, these limitations were addressed by selecting a diverse panel of participants, checking the consistency of the matrices, and conducting a collective discussion of the results. Thus, the contribution of the work lies in the systematic integration of the AHP with a participatory approach, offering a transparent

and replicable methodological framework to support decision-making in multi-stakeholder scenarios.

VII. CONCLUSIONS

The research questions are validated by defining ravine typologies using variables prioritized by key actors versus CC, and by considering their characterization and prevalence in the case study. Looking at risk, coverage, and infrastructure in an integrated manner determined the direct and scalar relationships of the ravines within a water system capable of addressing the impacts of CC, such as flood resilience and air quality improvement, among others. In this context, the research seeks to link urban inhabitants and ravines, seeking a healthy relationship that engages with the geography of water, and, from this, builds natural and semi-natural habitats that are resilient to CC, integrating responsible socio-economic uses. Finally, the research supports decision-making regarding CC in urban planning by defining ravine types based on their adaptive capacity, thereby facilitating the hierarchical organization of interventions across the region.

VIII. SUPPLEMENTARY MATERIAL

The supporting information can be downloaded at: https://issuu.com/clauidiagr/docs/tabla_suplementaria_s1, Table C1: Six typologies of urban streams. C.G. M.T. F.R. G.S.

IX. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, C.G.R., M.T.G., G.S.M.; Data curation, C.G.R., F.R.B., G.S.M.; Formal analysis, M.T.G.; Acquisition of financing, C.G.R., M.T.G., G.S.M.; Research, C.G.R., M.T.G., G.S.M.; Methodology, C.G.R., M.T.G., F.R.B., G.S.M.; Project Management, C.G.R.; Software, F.R.B.; Supervision, C.G.R., M.T.G., F.R.B., G.S.M.; Validation, C.G.R., M.T.G., F.R.B., G.S.M.; Visualization, C.G.R., F.R.B.; Writing – original draft, C.G.R., F.R.B.; Writing – revision and editing, C.G.R.

X. BIBLIOGRAPHIC REFERENCES

Alzate Buitrago, A. (22-26 February 2021). *Modeling mass wasting susceptibility maps using heuristic methods in the Dosquebradas municipality, Colombia* [Paper presentation]. Proceedings of the XIII International Symposium on Landslides. <https://www.issmge.org/uploads/publications/105/106/ISL2020-103.pdf>

Arellano, B., & Roca, J. (2015). Planificación urbana y cambio climático [Text en actes de congrés] in. *Reunión de Estudios Regionales, XLI Reunión de Estudios Regionales AECR: International conference on regional science: innovation and geographical spillovers: new approaches and evidence* (pp 1-18). Universitat Rovira i Virgili. <https://hdl.handle.net/2117/84561>

Baladia, E., Martínez-Rodríguez, R., Martínez-Sanz, J. M., Norte-Navarro, A. I., & Ortiz-Moncada, R. (2015). Formulación de políticas nutricionales informadas por

la evidencia, *Revista Española de Nutrición Humana y Dietética*, 19(2), 56-57. <https://doi.org/10.14306/renhyd.19.2.162>

Barton, J. (2009). Adaptación al cambio climático en la planificación de ciudades-regiones. *Revista de geografía Norte Grande*, (43), 5-30. <https://doi.org/10.4067/S0718-34022009000200001>

Bousquet, M., Kuller, M., Lacroix, S., & Vanrolleghem, P. A. (2023). A critical review of multicriteria decision analysis practices in planning of urban green spaces and nature-based solutions. *Blue-Green Systems*, 5(2), 200-219. <https://doi.org/10.2166/bgs.2023.132>

Canteiro, M., Cotler, H., Mazari-Hiriart M., Babinet, N., & Maass, M. (2024). Natural dynamics and watershed approach incorporation in urban water management: A scoping review. *PLOS One*, 19(8), e0309239. <https://doi.org/10.1371/journal.pone.0309239>

Delgado Ramos, G. C. (2014). Ciudad, agua y cambio climático: una aproximación desde el metabolismo urbano. *Medio ambiente y urbanización*, 80(1), 95-123. <https://www.intentaconnect.com/contentone/ieal/meda/2014/00000080/00000001/art00005#>

Ferrario, F., Mourato, J. M., Rodrigues, M. S., & Dias, L. F. (2024). Evaluating Nature-based Solutions as urban resilience and climate adaptation tools: A meta-analysis of their benefits on heatwaves and floods. *Science of the Total Environment*, 950, 175179. <https://doi.org/10.1016/j.scitotenv.2024.175179>

Fu, X., Hopton, M. E., & Wang, X. (2021). Assessment of green infrastructure performance through an urban resilience lens. *Journal of Cleaner Production*, 289, 125146. <https://doi.org/10.1016/j.jclepro.2020.125146>

Gallopín, G. (2003). *Sostenibilidad y desarrollo sostenible: un enfoque sistémico*. Naciones Unidas - CEPAL. <https://hdl.handle.net/11362/5763>

Goepel, K. D. (2018). Implementation of an online software tool for the analytic hierarchy process (AHP-OS). *International Journal of the Analytic Hierarchy Process*, 10(3), 469-487. <https://doi.org/10.13033/ijahp.v10i3.590>

Gregory, S. V., Swanson, F. J., Mckee, W. A., & Cummins, K. W. (1991). An ecosystem perspective of riparian zones: Focus on links between land and water. *BioScience*, 41(8), 540-551. <https://doi.org/10.2307/1311607>

Guastella, G., Oueslati, W., & Pareglio, S. (2019). Patterns of urban spatial expansion in European cities. *Sustainability*, 11(8), 2247. <https://doi.org/10.3390/su11082247>

Intergovernmental Panel on Climate Change [IPCC]. (2023). SPM- Summary for policymakers in V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Coud, Y. Chen L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonny, J. B. R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekci, R. Yu, & B. Zhou (Eds.), *Climate Change 2021- The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 3-32). Cambridge University Press. <https://doi.org/10.1017/9781009157896.001>

İnançoğlu, S., Özden, Ö. & Kara, C. (2020). Green corridors in urban landscapes, case study Nicosia Pedieos River. *European Journal of Sustainable Development*, 9(1), 1-8. <http://dx.doi.org/10.14207/ejsd.2020.v9n1p1>

Instituto Nacional de Estadística y Censos [INEC]. (31 de octubre de 2022). *Resultados. Censo Ecuador*. <https://www.censoecuador.gob.ec/resultados-censo/>

Jiang, A. Z., & Mcbean, E. A. (2021). Sponge city: using the “one water” concept to improve understanding of flood management effectiveness. *Water*, 13(5), 583. <https://doi.org/10.3390/w13050583>

Kaur, R., & Gupta, K. (2022). Blue-Green Infrastructure (BGI) network in urban areas for sustainable storm water management: A geospatial approach. *City and Environment Interactions*, 16, 100087. <https://doi.org/10.1016/j.cacint.2022.100087>

Kozak, D., Henderson, H., De Castro-Mazarro, A., Rotbart, D., & Aradas, R. (2020). Blue-Green Infrastructure (BGI) in Dense Urban Watersheds. The Case of the Medrano Stream Basin (MSB) in Buenos Aires. *Sustainability*, 12(6), 2163. <https://doi.org/10.3390/su12062163>

Kupilas, B., Burdon, F.J., Thaulow, J., Häll, J., Mutinova, P.T., Forio, M.A.E., Witing, F., Rîșnoveanu, G., Goethals, P., McKie, B. G., & Friberg, N. (2021). Forested riparian zones provide important habitat for fish in urban streams. *Water*, 13(6), 877. <https://doi.org/10.3390/w13060877>

Li, S., Zhang, J., Jiang, P., & Zhang, L. (2022). Linking land use with riverine water quality: A multi-spatial scale analysis relating to various riparian strips. *Frontiers in Environmental Science*, 10, 1-15. <https://doi.org/10.3389/fenvs.2022.1013318>

Meerow, S., & Newell, J. P. (2017). Spatial planning for multifunctional green infrastructure: growing resilience in Detroit. *Landscape and Urban Planning*, 159, 62-75. <http://dx.doi.org/10.1016/j.landurbplan.2016.10.005>

Mendoza, A., Solano, C., Palencia, D. & García, D. (2019). Aplicación del proceso de jerarquía analítica (AHP) para la toma de decisión con juicios de expertos. *Ingeniare. Revista Chilena de Ingeniería*, 27(3), 348-360. <https://ingeniare.uta.cl/index.php/inge/article/view/1069>

Montenegro, J. & Arteta, J. (2019). Multiparametric AHP-based flood hazard zonation approach in northwestern Peru at basin scale in L. Calvo (Ed.) *Proceedings of the 38th IAHR World Congress, Panama 2019*. International Association for Hydro-Environment Engineering and Research (IAHR). <https://www.iahr.org/library/infor?pid=3492>

Municipio de Loja. (2021). *Diagnostico Ciudad de Loja. Plan de Uso y Gestión del Suelo del cantón Loja*. https://www.loja.gob.ec/files/image/LOTAIP/pugs-2020_2032.pdf

Nieto-Cañarte, C., Lozano-Mendoza, P. H., Guamán-Sarango, V. M., Vélez-Ruiz, M. C. & Domínguez-Zúñiga, W. M. (2025). Crecimiento urbano y vulnerabilidad al cambio climático de la conurbación de Quevedo, Ecuador. *Urbano*, 28(51), 96-105. <https://doi.org/10.22320/07183607.2025.28.51.08>

Pérez-Ramírez, R., & Martínez-Damián, M. Á. (2020). Modelo de decisión multicriterio para seleccionar los mejores proyectos productivos en el medio rural mexicano. *Agro Productividad*, 13(2), 101-107. <https://doi.org/10.32854/agrop.vi.1470>

Pradilla, G., & Hack, J. (2024). An urban rivers renaissance? Stream restoration and green-blue infrastructure in Latin America – Insights from urban planning in Colombia. *Urban Ecosystems*, 27(6), 2245–2265. <https://doi.org/10.1007/s11252-024-01571-9>

Rangwala, T. (2024). Literature review: adaptative planning practices. *Water*, 16(12), 1657. <https://doi.org/10.3390/w16121657>

Romero, H., & Vásquez, A. (2005). Evaluación ambiental del proceso de urbanización de las cuencas del piedemonte andino de Santiago de Chile. *Revista EURE - Revista De Estudios Urbano Regionales*, 31(94), 97-117. <http://dx.doi.org/10.4067/S0250-71612005009400006>

Saaty, T. L. (1990). How to make a decision: The analytic hierarchy process. *European Journal of Operational Research*, 48(1), 9-26. [https://doi.org/10.1016/0377-2217\(90\)90057-1](https://doi.org/10.1016/0377-2217(90)90057-1)

Sánchez-Almodóvar, E., Olcina-Cantos, J., Martí-Talavera, J., Prieto-Cerdán, A., & Padilla-Blanco, A. (2023). Floods and adaptation to climate change in tourist areas: management experiences on the coast of the province of Alicante (Spain). *Water*, 15(4), 807. <https://doi.org/10.3390/w15040807>

Secretaría del Ambiente. (2025). *Plan Estratégico Ambiental Integral en los Ríos y Quebradas de Quito*. Secretaría del Ambiente – Dirección Metropolitana de recursos Naturales, Quito-Ecuador. <https://storage.ghost.io/c/0c/ce/0cceb189-436d-4289-aa24-ba16ceb9a983/content/files/2025/05/Quebradas.pdf>

Valera, K., y Sharifi, A. (2025). Index-based mapping and assessment of flood vulnerability for climate adaptation at the neighborhood level: A case study of Santo Domingo, the Dominican Republic. *International Journal of Disaster Risk Reduction*, 120, 105362. <https://doi.org/10.1016/j.ijdrr.2025.105362>

Vásquez, A. E. (2016). Infraestructura verde, servicios ecosistémicos y sus aportes para enfrentar el cambio climático en ciudades: el caso del corredor ribereño del

río Mapocho en Santiago de Chile. *Revista de geografía Norte Grande*, (63), 63-86. <https://dx.doi.org/10.4067/S0718-34022016000100005>

Venkataramanan, V., Lopez, D., McCuskey, D. J., Kiefus, D., McDonald, R. I., Miller, W. M., Packman, A. I., & Young, S. L. (2020). Knowledge, attitudes, intentions, and behavior related to green infrastructure for flood management: A systematic literature review. *Science of The Total Environment*, 720, 137606. <https://doi.org/10.1016/j.scitotenv.2020.137606>

Vidal, C., & Romero Aravena, H. (2010). Efectos ambientales de la urbanización de las cuencas de los ríos Biobío y Andalién sobre los riesgos de inundación y anegamiento de la ciudad de Concepción en L. Pérez, e R. Hidalgo Dattwyler (Eds.), *Serie GEOlibros, Instituto de Geografía*. Pontificia Universidad Católica de Chile. <https://repositorio.uchile.cl/handle/2250/118084>

Vörösmarty, C. J., Rodríguez Osuna, V., Koehler, D. A., Klop, P., Spengler, J. D., Buonocore, J. J., Cak, A. D., Tessler, Z. D., Corsi, F., Green, P. A., & Sánchez, R. (2018). Scientifically assess impacts of sustainable investments. *Science*, 359(6375), 523-525. <https://doi.org/10.1126/science.aao3895>

Warner, J. F., Van Buuren, A., & Edelenbos, J. (2012). *Making Space for the River: Governance Experiences with Multifunctional River Flood Management in the US and Europe*, IWA Publishing.

Yu, Q., Li, N., Wang, J., & Wang, S. (2023). Comprehensive performance assessment for sponge city construction: a case study. *Water*, 15(23), 4039. <https://doi.org/10.3390/w15234039>

Zingraff-Hamed, A., Bonnefond, M., Bonthoux, S., Legay, N., Greulich, S., Robert, A., Rotgé, V. Serrano, J., Cao, Y., Bala, R., Vazha, A., Tharme, R. E., & Wantzen, K. M. (2021). Human-river encounter sites: looking for harmony between humans and nature in cities. *Sustainability*, 13(5), 2864. <https://doi.org/10.3390/su13052864>

XI. ACKNOWLEDGMENTS

This work is derived from the research project of the Private Technical University of Loja with external financing from the German Cooperation GIZ Ecuador under its Sustainable Cities program, in alliance with the Decentralized Autonomous Government of the Loja Canton.

SELF-PRODUCED SETTLEMENTS IN THE BAJO PIURA DESERT, PERU: BETWEEN THE EXTRACTIVE AND RISK SCALES ¹

ASENTAMIENTOS AUTOPRODUCIDOS EN EL DESIERTO DEL BAJO PIURA, PERÚ: ENTRE
ESCALA EXTRACTIVA Y ESCALA DEL RIESGO

PATRICIA CALDAS-TORRES ²
EDITH ARANDA-DIOSES ³

¹ Instituto de Investigación de la Facultad de Arquitectura, Urbanismo y Artes (INIFAUA), Resolución Decanal N°056-2022 FAUA-UNI, 03 de marzo de 2022 "Transformaciones socioambientales y socioespaciales en la costa de la región Piura: Desafíos para la planificación del desarrollo sostenible frente al Fenómeno El Niño y la urbanización capitalista"

² Doctora en Ciencias Económicas y Sociales
Docente e investigadora, Facultad de Arquitectura, Urbanismo y Artes
Universidad Nacional de Ingeniería, Lima, Perú
<https://orcid.org/0000-0002-5352-353X>
pcaldas@uni.edu.pe

³ Doctora en Ciencias Sociales
Investigadora RENACYT-CONCYTEC P0050832
Facultad de Ingeniería Económica; Estadística y Ciencias Sociales
Universidad Nacional de Ingeniería, Lima, Perú
<https://orcid.org/0000-0003-4393-261X>
earandad@uni.edu.pe

El objetivo del artículo es estudiar la producción del espacio en el Bajo Piura, territorio comunal híbrido (rural-urbano) donde se articulan el valle y el desierto y confluyen las dinámicas extractivas y los riesgos climáticos. Se aplican tres categorías de análisis: la escala extractiva, la escala del riesgo (ambas desde la relación capital-naturaleza) y los asentamientos autoproducidos, para examinar cómo se manifiestan los vínculos entre la acumulación del capital, la crisis climática y la autoproducción del hábitat, en condiciones de desregulación estatal y de mercados informales de tierra. La metodología mixta combina el enfoque cualitativo y socioespacial y se basa en entrevistas semiestructuradas y en la revisión de cartografía y de planes urbano-territoriales. Los resultados muestran la escala extractiva y la del riesgo como producto del espacio concebido, ignorando las prácticas comunitarias frente a la incertidumbre. Los instrumentos de planificación respaldan esta lógica y naturalizan el riesgo al proponer áreas de expansión del capital que estimulan la especulación en el mercado de tierras. En la nueva ruralidad, los asentamientos-refugio del desierto manifiestan la reapropiación del territorio comunal según criterios resilientes. Se propone reconocer el territorio del Bajo Piura como unidad intermedia de planificación, en la política de desarrollo sostenible, que considere la cultura ambiental local y el derecho a un territorio seguro.

Palabras clave: relación capital-naturaleza, escala extractiva, escala del riesgo, asentamientos autoproducidos del desierto, territorio híbrido

This article aims to study the production of space in Bajo Piura, a hybrid (rural-urban) area where the valley and desert intersect, and where extractive dynamics and climate risks converge. The analysis is structured around three analytical categories: extractive scale, risk scale (both approached through the capital-nature relationship), and self-produced settlements. The objective is to analyze how links between capital accumulation, the climate crisis, and habitat self-production manifest under conditions of state deregulation and informal land markets. The mixed-methods approach combines qualitative and socio-spatial perspectives, drawing on semi-structured interviews, cartographic data, and urban-territorial plans. The results reveal that the extractive and risk scales are a product of the conceived space, ignoring community practices amid uncertainty. The planning instruments reinforce this logic, naturalizing risk by proposing areas for capital expansion that stimulate speculation in land markets. In the new rurality, desert refuge settlements exemplify the reappropriation of communal land in line with resilient principles. The study proposes recognizing the Bajo Piura as an intermediate planning unit within a sustainable development framework that considers local environmental culture and the right to a safe territory.

Keywords: capital-nature relationship, extractive scale, risk scale, self-produced desert settlements, hybrid areas

I. INTRODUCTION

In Latin America, extractivism is a structural phenomenon historically found in the mining, hydrocarbon, and agricultural export sectors, all of which have substantial socio-environmental effects. Its intervention in rural communities is one of the starkest expressions of the capitalist model (Gudynas, 2015; Svampa, 2013). In this context, a phenomenon that needs to be analyzed is the relationship among extractivism, the climate crisis, and territorial transformations (Bebbington, 2015), which holds that accumulation entails not only the overexploitation of natural resources but also the over-determination of capitalist production by marginal rural groups and their cultures. These develop appropriation practices within ecosystems (Leff, 2004) in the face of recurrent climate crises, drought, and extreme weather events, which are intensified by extractive dynamics. Thus, the destruction is not only material but also social and cultural (Bebbington, 2025), creating structural conditions that enable the emergence of self-managed habitats as living spaces. In this process, the conceived space is structured by the rationality of extractive capital that reorganizes the area, by the State (Gonzales-Comín, 2023), and by the naturalization of risk through technocratic planning devices (Swyngedouw, 2010).

In predominantly agricultural communal areas, both agro-extractivism and mining and hydrocarbon extraction operate, above all, through symbolic deterritorialization processes of dispossession, achieved through effective physical displacement. Most residents remain in the area, embodying a community value rooted in ties to the land that resists extractive logics (Giraldo, 2015; Bebbington, 2025). This phenomenon is understood in terms of new rurality, characterized by a greater presence of transnational (extractive) companies and rural productive diversification, with an increasing role for the service sector (Gaudin, 2023). The case of the Bajo Piura Valley on the Peruvian north coast, in the department of Piura, the second most populous department in the country, is paradigmatic for the following reasons: i) its high vulnerability to the El Niño Phenomenon (ENP); ii) the accelerated expansion of towns; iii) the concentration of different extraction activities, and iv) the presence of rural communities with small production units. Likewise, the growing transnational intervention in the formulation of planning instruments under the "Reconstruction with Changes" program (Law N° 30556, 2017; Ministry of Housing, Construction and Sanitation [MVCS], 2019) regularizes the rearrangement of space that capital had previously consolidated. Although there are studies on the transformation of the region (Revesz & Oriden, 2011), changes in rural communities, conflicts over land and water grabbing (Diez Hurtado, 2024; Burneo, 2020), land trafficking (Diez Hurtado, 2023) and state disaster management (Castillo Fernández, 2023; Escobedo Vargas, 2022), the particularities of the production of space, marked by the confrontation between an extractive

rationality and everyday practices that are based on necessity and community reappropriation, have yet to be analyzed.

This article analyzes how the links among self-produced settlements (SS), intensive extractivism, and extreme climate risk manifest in Lower Piura, in the context of state deregulation and informal land markets. Based on the capital-nature relationship (Harvey, 2014), three analytical categories are proposed: a) the extractive scale as the territorialization of capital; b) the risk scale, reinforced by the capital-State relationship, which involves planning instruments developed by transnational agents (IPATs), linked to the extractive sector; and finally, c) the SSs as a lived space, where resilient strategies emerge. A mixed methodology, combining qualitative and socio-spatial approaches, is applied, based on semi-structured interviews with key actors and the review of cartography and urban-territorial plans. The aim is to understand the implications of these changes in regional restructuring for community culture, social capital, and agency capacity in the SSs, with respect to planning and sustainable development.

II. THEORETICAL FRAMEWORK

The reflection considers three categories: extractive scale, risk scale, and self-produced settlements. It starts from the capital-nature relationship, whose contradictions are exacerbated in regions with localized climatic risks and extractive dynamics. Thus, disasters are exploited for capital accumulation, nature is reconfigured, climate crises are framed as investment opportunities, and socio-environmental costs are externalized (Harvey, 2014).

The *extractive scale* and the *risk scale* are conceived as socio-spatial and relational constructs grounded in power logics (Brenner, 2001; Swyngedouw, 2010). The *extractive scale* entails the consolidation of areas of exception (Gudynas, 2015) through the dispossession and enclosure of land and water, revealing an environmental structural violence that subordinates ways of life to capital accumulation. Knowledge and ways of inhabiting the area that are linked to ecosystems are ignored (Sassen, 2015; Svampa, 2013; Leff, 2004), and inequalities in access to and control of natural resources appear, thereby worsening vulnerability to climate crises (Bebbington, 2025). The *risk scale* is exacerbated by the extractive scale, especially in coastal areas facing water scarcity, justifying the displacement of inhabitants through capitalist expansion facilitated by the capital-state relationship (Gober, 2010; Swyngedouw, 2010). From the conceived space, both scales generate fragmentation, transforming the ties among territory, local environmental culture, and sustainability, showing that capital's material reorganization of space precedes its representation in planning instruments (Lefebvre, 1974).

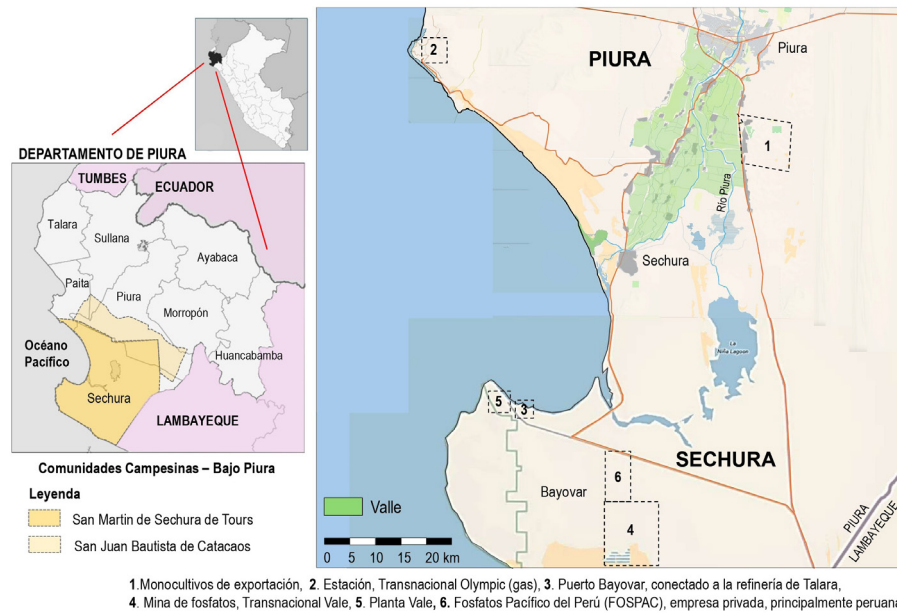


Figure 1. Map of extractive activities in Bajo Piura. Source: Prepared by the authors using information from the National Geographic Institute [IGN] (2025a).

The concept of *self-produced settlement* (SS) in rural environments is also introduced as a living space where extractive dynamics erupt, and its relationship with climate vulnerability is examined. In the new ruralities, the SSs reflect the reconfiguration of the rural as a space of productive diversification, traversed by global dynamics and urban expansion processes, as a case of rural-urban hybridization (Gaudin, 2023; Pérez-Martínez, 2016). In Peru, these changes also include the increase of communal population inhabiting informal settlements, greater interaction between rural and urban spaces, and greater socio-environmental conflicts due to the overlap of extractive uses over traditional communal land uses (agriculture, grazing, and shelters against climatic events) (Diez Hurtado, 2023; Burneo, 2020). These transformations show how the intervention of capital generates territorial exclusion, especially where extractivism is based on pre-existing power structures. In response to these conditions, most residents remain on communal land. For them, destruction is ontological, leading them to develop forms of space control that are strongly intertwined with the land (Diez Hurtado, 2024; Giraldo, 2015; Bebbington, 2025). Thus, they reterritorialize marginal spaces where precariousness coexists with subaltern means of territorial appropriation (Santos, 2000).

The rise of new forms of precarious urbanization in rural areas stems from extractive logics and risk policies that fail to identify the causes of socio-natural disasters (Castillo Fernández, 2023) or to consider local practices and knowledge

related to climate adaptation. SSs are understood as a form of self-resolution of housing needs, configured as an alternative for shelter. From the vulnerability conditions associated with poverty emerges the active and creative role of its residents as producers of the habitat. Thus, they configure spaces amid uncertainty, guiding their socio-spatial construction through resilient social practices and patterns of occupation (Araya Ramírez, 2018). Participation and their appropriation strategies are key to confronting the opportunities and adversities inherent in the territory they inhabit. Thus, to shed light on the transformation of the territory by the intervention of capital and the agency of the inhabitants, the categories of conceived space and lived space of Lefebvre (1974) have been incorporated.

III. CASE STUDY

Bajo Piura covers approximately 5,544 km² in an area between the city of Piura (158,495 inhabitants), the regional capital and the main pole of attraction, and the city of Sechura (44,590 inhabitants), the provincial capital and coastal node (National Institute of Statistics and Informatics [INEI], 2018). Its communities, San Juan Bautista de Catacaos (SJBC) and San Martín de Tours de Sechura (SMTS), have economies based on small family farming and artisanal fishing (Revesz & Oliden, 2011), within a department with high rates of monetary poverty (25.4% - 29.65%) and extreme monetary poverty

(2.9% - 4.3%) (INEI, 2026). It concentrates export monocultures, hydrocarbon (gas) reserves, and one of the largest phosphate deposits in South America, which is key to fertilizer production (Figure 1). Sechura stands out for the aquaculture boom that has consolidated a highly specialized sector, and for being the province with the highest population increase in the region between 2007 and 2017 (27.05%), surpassing that of Metropolitan Lima (12.35%) (INEI, 2018). The informal expansion characterizes the urban growth of Sechura, which has increased its surface area fivefold between 1990 and 2024. At the same time, conurbations such as Cura Mori-El Tallán and La Arena-La Unión-Vice have been configured along highways on the valley's edges. Bajo Piura is highly vulnerable to ENP, which causes recurrent impacts, including floods and droughts (Ministry of the Environment [MINAM], 2014).

IV. METHODOLOGY

A mixed-methods approach was applied, combining a qualitative, socio-spatial approach with semi-structured interviews, cartographic analysis, and the interpretation of secondary sources. The interviews were conducted during the fieldwork, in June 2022, under the following selection criteria: local stakeholders with life experiences regarding extractive activities and the ENP, including villagers, farmers, members of the local community, and specialists in research and promotion of rural groups, in environmental issues, and in territorial management (provincial municipalities of Sechura and Piura). The analysis took place in two stages: systematizing the collected information into categories and conducting content analysis. An interpretative mapping was also developed by combining official geospatial databases and institutional mapping with satellite imagery (Google Earth 2005-2024), which demonstrated the tensions of territorial dynamics, extractivism, and climate risk. The triangulation of sources, on the one hand, the official cartography; on the other hand, the sources of civil society (CooperAcción, 2024) and local media (podcasts, Radio Cutivalú (Jimenez Arévalo, 2024)), allowed the incorporation of qualitative dimensions, conflicts, and territorial perceptions. Cartography was used from the National Geographic Institute [IGN], the Ministry of Agrarian Development and Irrigation [MIDAGRI], the Geological, Mining and Metallurgical Institute [INGEMET], the National Institute of Civil Defense [INDECI] (2018), and the Ministry of the Environment [MINAM]. For territorial planning, instruments developed by transnational agents, which we have called IPATs, including the Urban Development Plans of Sechura (MVCS, 2023) and of the Cura Mori-El Tallán conurbation, and the Territorial Conditioning Plan of Piura (PAT) (MVCS, 2020a), were selected.

V. RESULTS

a. The extractive scale as the territorialization of capital

The extractive scale in Bajo Piura, a historically communal area, is characterized by the concentration of monocultures, hydrocarbons, and enclave-type mining, which generate cumulative territorial impacts. In Cura Mori, located in the SJBC community, capital produces its own space by reconfiguring nature as a commodity under an agro-extractive logic that appropriates resources such as water and land. This dynamic is facilitated by the state hydraulic works (Escobedo Vargas, 2022), which alter the Piura River's channels, thereby increasing the vulnerability of farmers and villagers in Catacaos and Sechura to floods and droughts (Alex, personal communication, June 6th, 2022). The traditional practice of harvesting rainwater generated by the ENP is marginalized. At the same time, a system of ditches in the valley and the Ramón and Ñapique lagoons in the desert consolidates the use of the river's natural overflow. Modern technology blocks both forms of water control, as it shows that the extractive scale not only depletes natural resources but also erodes sustainable local knowledge.

A new phase of extractive capital development begins with the dispossession of communal lands, legitimized by regulations that classify dry forest lands as "barren lands", which encourage their commodification (Legislative Decree No. 653, 1991, Article 23). The lack of official registration of the SJBC community's lands has facilitated dispossession (Burneo, 2020). In Cura Mori, the environmental and cultural value of this ecosystem as a refuge from the ENP is rendered invisible by capitalist rationality, which, by seizing land to expand monocultures, installs a new form of production on communal land that the inhabitants conceive as a common good.

In contrast, in the SMST community, the lands are owned, and the mining fee is a new collective good in dispute. Extractive rents are negotiated, although inequalities and material vulnerability persist (Diez Hurtado, 2017), as manifested in poor living conditions and casual, precarious employment. The phosphate deposits eliminate a grazing area between the mine and the Virrilá estuary, and the mining concessions occupy natural conservation areas (Fernando, personal communication, June 7th, 2022), as part of the usurpation process, with environmental impacts that pollute the air and water and cause biodiversity loss and fisheries degradation. The Vice district is losing more than half of its surface area near the hydrocarbon station of a transnational company, the same one that is installing a gas pipeline in Chusis, appropriating an agricultural strip (Gonzalo, personal communication, June 7th, 2022). These forms of predatory extractivism (Gudynas, 2015) exacerbate territorial fragmentation and marginalize local communities (Figure 2).

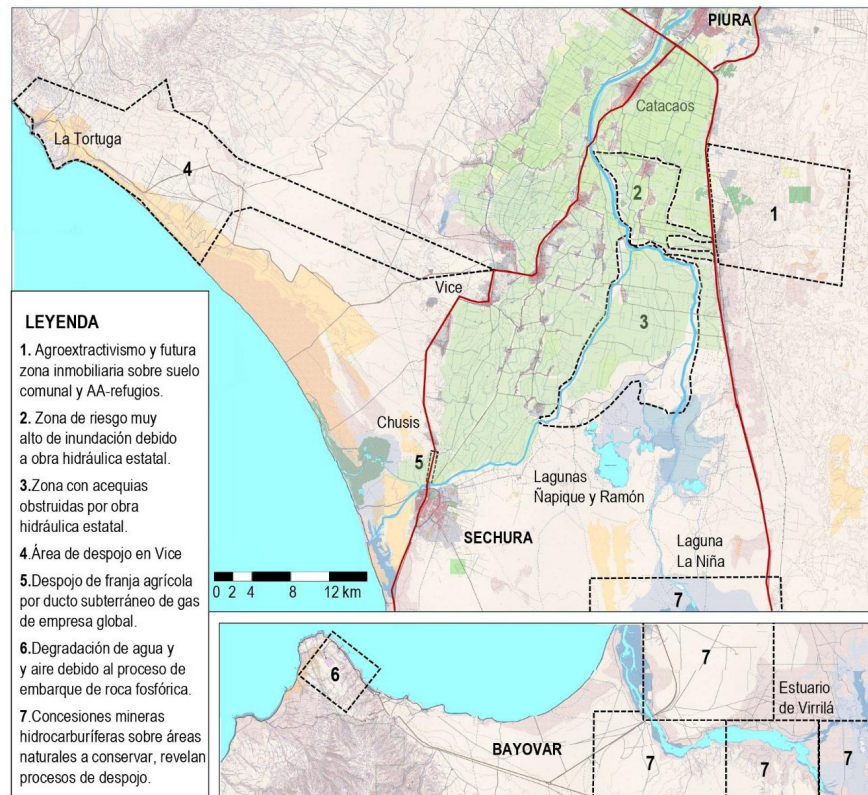


Figure 2. Map showing the extractive scale in Bajo Piura. Source: Prepared by the authors considering the District Municipality of Cura Mori (2020); MIDAGRI (n.d.); Intercultural Communication Services [SERVINDI] (2023); CooperAction (2024).

b. The risk scale and the capital-state relationship

In Bajo Piura, the inhabitants recognize both the positive and negative impacts of the ENP: they value rainwater that supports pelagic fishing, aquifer recharge, and the regeneration of dry forests, but they suffer the loss of agricultural land, infrastructure, and basic services (MINAM, 2014). The unpredictability of natural disasters is exploited by capital, which transforms environmental crises into opportunities for accumulation (Harvey, 2014). “Disaster capitalism” is combined with a “disaster policy”; the State instrumentalizes the discourse of risk to legitimize interventions, without addressing the structural causes of the vulnerability. While the capital-State relationship reinforces risk exposure (Castillo Fernández, 2023), the inhabitants reaffirm community ties that promote territorial defense practices, especially of refuge spaces, where the SSs, despite the precariousness, reveal a “geographical wisdom” in the resilient occupation of the desert (Burneo, 2020; Díez Hurtado, 2023).

After the ENP of 1997-1998, the State, taking advantage of the uncertainty, encouraged the conversion of dry forest into monocultures, for the sake of agricultural modernization. Companies expanded cultivation areas that reserve real

estate areas of interest (Jimenez Arévalo, 2024). During the 2017 ENP emergency, thousands of residents of Cura Mori moved to the dry forest to seek refuge after facing expulsion (Carmen, personal communication, June 5th, 2022). A form of accumulation by dispossession that benefits from the disaster is revealed (Harvey, 2004; Burneo, 2020), thereby increasing vulnerability. The SSs on communal lands sheltered the victims of villages affected by the floods and the Yaku Cyclone associated with El Niño 2023. The failed state housing project “*Una sola Fuerza*”, located on the edge of the city of Piura, far from the living areas of the affected population, exemplifies the disconnect between reconstruction policies and ways of inhabiting the desert, connected to the agricultural valley (Beberly, personal communication, June 8th, 2022). Similarly, it is shown that state risk management does not propose preventive strategies; it reproduces risk socially by focusing on post-disaster reconstruction based on physical works, often marked by corruption and technical deficiencies (Castillo Fernández, 2023).

In Bajo Piura, there is a “conceived space” that is intervened in by capital in line with its interests. In the monoculture area of

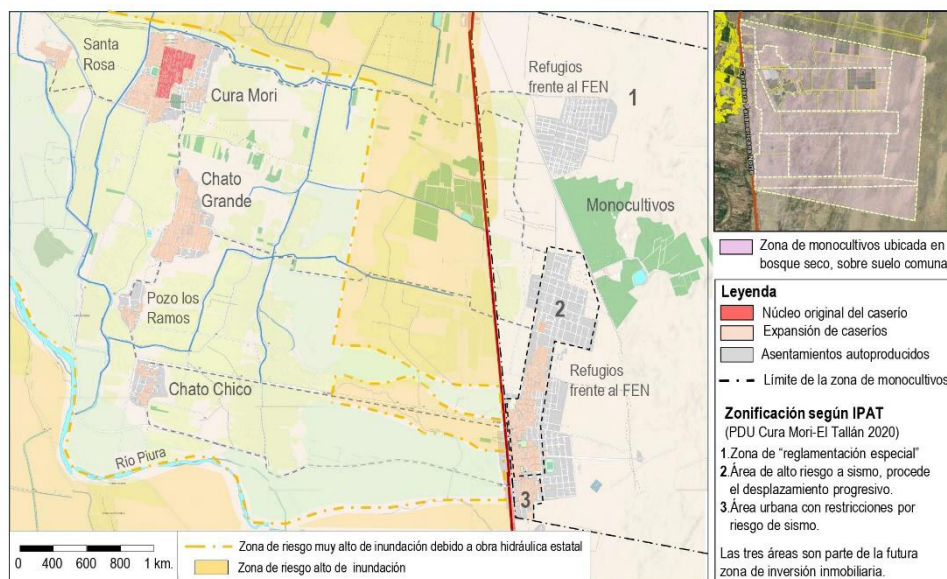


Figure 3. Map of the risk scale in Cura Mori. Source: Prepared by the authors using information from the National Geographic Institute [IGN] (2025c).

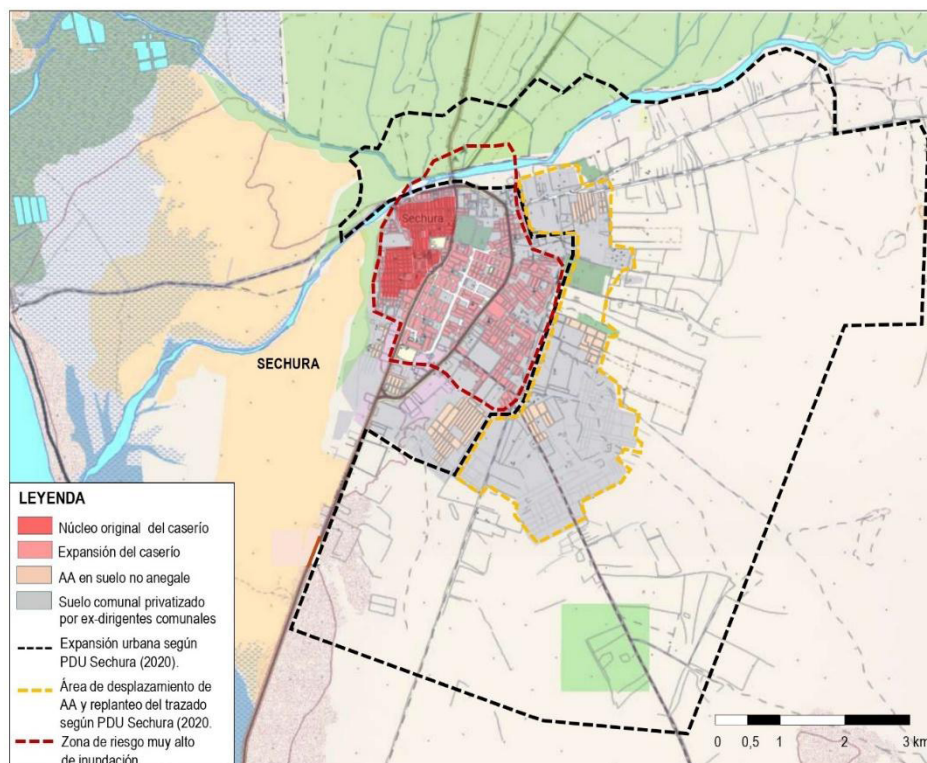


Figure 4. Map of the risk scale in Sechura. Source: Prepared by the authors using information from the National Geographic Institute [IGN] (2025b).

Cura Mori, urban expansion is determined by new geographies of exploitation of agro-extractivism surpluses (Gonzales-Comín, 2023). The IPATs define a territorial regulatory framework that prevents the official recognition of shelter settlements or proposes displacing them, and prioritize future areas of capitalist accumulation, thereby further relegating local environmental culture. The Urban Development Plan (PDU) of the “Cura Mori- El Tallán” conurbation (2020-2030) (MVCS, 2020b) uses risk to justify progressive displacements of SSs, by freeing urban land for real estate valorization (Figure 3). The Sechura PDU (2020-2030) (MVCS, 2023) quadruples the existing urban area by replacing the SSs, arguing that the disorganization of its layout comes from the informal land market (Figure 4). The proposed zoning supports territorial exclusion, exacerbates risk exposure, and stimulates informal markets of eroded land in areas reserved for urban expansion, leaving non-waterlogged soils increasingly vulnerable to land trafficking.

c. Self-produced settlements (SS) and community culture

In the communal system, the high-lying desert areas serve as shelters against ENP-induced floods, form spaces for dual residence or temporary relocation, and foster ecological complementarity between the valley and the desert (Burneo, 2020). This rotating occupation pattern connects the space inhabited by families with agricultural work, grazing, and fishing, facilitating survival and the seasonal diversification of economic activities to cope with climate uncertainty (Revesz & Oriden, 2011). In Cura Mori, the SSs are extensive occupations of the valley’s hamlets, where the inhabitants defend territorial rights against agro-extractivism. In Sechura, they occupy the edges of the valley and the city, in a context where communal land shifts from a collective good linked to traditional ways of life to an asset subject to informal transactions (Diez Hurtado, 2017). The local concept of territory is highly dynamic due to the alternation of subsistence activities across the coast, the valley, the desert, and the city. In both communities, territorial mobility is altered by agro-exports and phosphate mining, respectively.

In Sechura, phosphate mining has spurred small-scale economic ventures, and the aquaculture boom is boosting urban growth through the privatization of communal lands. The rural-urban relationship that attracts migrants living in the urban periphery is intensifying. Thus, urban infrastructure and basic services are under pressure, resulting in drinking water coverage for only 40% of the population (Levith, personal communication, June 8th, 2022).

In the new rural world, the SSs emerge from the need to connect the rural world with the urban one, given the lack of public investment in the countryside, because, despite the insertion of rural residents into the market, well-being conditions have not improved (Julio, personal communication, June 6th, 2022). These settlements show forms of reappropriation of territorial control and tensions in the production of space, marked by extractive and risk scales. There is a tendency to stay and take advantage of

proximity to the highway, family farms, villages, and hamlets, by setting up a kind of “living hedge” that surrounds the valley. This strengthens social ties and community identity.

VI. DISCUSSION

The analysis of the relationship between the extractive scale, the risk scale, and the self-produced settlement in a communal territory has allowed us to understand how the links between extractivism and climate crises affect the production of space. Both scales restructure the territory according to the accumulation of capital in scenarios of state absence. The result is a profoundly unequal geography, in which the SSs, based on ancestral knowledge, sustainable practices, and collective forms of reappropriation of communal territory, are subordinated to extractivist and speculative logics. According to the singularity of Bajo Piura’s coastal context exposed to the ENP, the intertwining between both scales is seen in the metabolic contradiction between capital and nature, visible in the enclosure of water and communal land, dispossession, ecological degradation, the social production of risk, and the instrumentalization of disasters as an opportunity for capital valorization, where these act as catalysts for accumulation.

The analysis allows us to identify self-produced settlements as a form of resistance, territorial organization, and climate adaptation in the face of both scales and state abandonment. The occupation patterns of the SSs configure a kind of “living hedge” of the valley in the face of dispossession, revealing resilient strategies to reappropriate common goods that produce spatial mobility and complementarity within the valley, the desert, and the coastline.

From the perspective of new rurality, the study shows that the convergence of the extractive and risk scales does not cancel out local territorialities, but reconfigures them in a conflictive way. The social production of the territory in Bajo Piura can only be understood in terms of this convergence: a dispute between competing territorial projects in which capital, the State, and local communities coexist and confront one another amid structural inequality.

The study’s implications for urban-territorial planning suggest that even in contexts of low implementation, planning is not neutral. Through categories and omissions, it can contribute to rendering settlements that constitute shelter spaces invisible and to generating favorable conditions for the capitalist valorization of the territory. Technocratic devices that indirectly align with these dynamics are evident. This raises the need to rethink planning through an integrated approach that combines the rural and the urban, recognizes the links between ways of living and ecosystems, and places these vital spaces at its heart amid climate uncertainty.

VII. CONCLUSIONS

The case of Bajo Piura shows how the relationship between the extractive scale, the risk scale, and the self-production of the habitat reorganizes the territory, subordinating it to accumulation circuits, and how the affected inhabitants, especially farmers and fishermen, resist these logics.

The transformation of Bajo Piura by the intervention of capital, through simultaneous intensive extractivism and risk capitalization, is part of the global capital logic that commodifies resources and even natural disasters, based on the reproduction of capitalist accumulation. The particular aspects of this experience lie in the invasive territorialization of capital, state permissiveness, and the reaction of excluded residents who produce the habitat, as a sample of rural territorialities.

The conceived space presents a differential production of risk, treating territories as financial assets rather than living spaces. It ignores the local environmental culture and redefines communal territories as spaces available for land valorization and the exploitation of natural resources.

The urgency of rethinking planning as an integrated, participatory, and ecosystemic process that connects the valley-desert-coastal unit and recovers environmental knowledge and practices of community culture lies in the need to respond to social and climatic crises. Thus, the SSs are strategies for controlling the lived space in the face of the brunt of capital, which ignores and renders invisible the capacity for agency and the resilience of those who conceive the territory as a repository of their sense of belonging.

VIII. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, P.C., E.A.; Data Curation, P.C.; Formal analysis, P.C., E.A.; Financing acquisition, P.C.; Research, P.C., E.A.; Methodology, P.C., E.A.; Project management, P.C.; Resources, P.C., Software, P.C.; Supervision, P.C.; Validation, P.C., E.A.; Visualization, P.C.; Writing- original draft, P.C., E.A.; Writing- revision and editing, P.C., E.A.

IX. BIBLIOGRAPHIC REFERENCES

Araya Ramírez, I. (2018). The space social construction of the places: a look from the turn special. *Revista Geográfica de América Central*, 3(61E), 553-568. <https://doi.org/10.15359/rgac.61-3.29>

Bebbington, A. (2015). Political Ecologies of Resource Extraction: Agendas Pendientes. *European Review of Latin American and Caribbean Studies*, (100), 85-98. <https://www.jstor.org/stable/43673540>

Bebbington, A. (2025). Destruction and the Complex Politics of Urgency: Responding to Contemporary Resource Extraction in the Shadow of COVID. *LSRI Research Papers*, (1), 1-17. https://lsri.campion.ox.ac.uk/sites/default/files/2026-03/lsri_research_paper_01.pdf

Brenner, N. (2001). The limits to scale? Methodological reflections on scalar structuration. *Progress in Human Geography*, 25(4), 591-614. <https://doi.org/10.1191/030913201682688959>

Burneo, M. (2020). Técnicas territoriales para la apropiación del bosque seco peruano: El caso de los comuneros de Catacaos frente al avance de la agroindustria en un contexto de emergencia humanitaria. *Territorios*, (42), 1-29. <https://www.doi.org/10.12804/revistas.urosario.edu.co/territorios/a.7736>

Castillo Fernández, M. (2023). La política del desastre: reconstruyendo ante todo obras sin controlar a tiempo la inundación y la corrupción. El caso de Piura. *Boletín Minero. CooperAcción*. <https://cooperaccion.org.pe/publicaciones/la-politica-del-desastre-reconstruyendo-ante-todo-obras-sin-controlar-a-tiempo-la-inundacion-y-la-corrupcion-el-caso-de-piura/>

CooperAcción. (16 de agosto de 2024). Mapa de concesiones mineras en el departamento de Piura, al mes de abril del año 2024. <https://cooperaccion.org.pe/mapas/piura-abril-2024/>

Decreto Legislativo N° 653 de 1991. [Poder Ejecutivo del Perú]. Por el cual se establecen que la propiedad de las tierras eriazas, sin excepción, corresponde al Estado. Artículo 23, 1 de agosto 1991. Normas Legales, Título III, Capítulo I. Diario El Peruano. <https://img.lpderecho.pe/wp-content/uploads/2023/11/Decreto-Legislativo-653-LPDerecho.pdf>

Diez Hurtado, A. (2017). Propiedad y territorio como (diferentes) bienes comunes. El caso de las tierras de comunidades en la costa norte peruana. *Eutopía. Revista de Desarrollo Económico Territorial*, (11), 17-39. <http://hdl.handle.net/10469/12770>

Diez Hurtado, A. (2023). *Las múltiples dimensiones del tráfico de tierras en la costa peruana*. Coordinadora Nacional de Derechos Humanos. <https://derechoshumanos.pe/las-multiples-dimensiones-del-trafico-de-tierras-en-la-costa-peruana/>

Diez Hurtado, A. (2024). Comunidades en la encrucijada: desgobierno, despojo y peligro en la costa peruana. *Debate Agrario*, (51), 183-217. <https://cepes.org.pe/wp-content/uploads/2024/04/DA-51-DIEZ-F-184-218.pdf>

Escobedo Vargas, M. C. (2022). *Reconstrucción desde los hogares ¿un Estado ausente?: estrategias de adaptación tras el desastre siconatural en Cura Mori, Piura entre 2017-2019* [Tesis de Licenciatura, Pontificia Universidad Católica del Perú]. Repositorio PUCP. <https://hdl.handle.net/20.500.12404/21762>

Gaudin, Y. (2023). La nueva ruralidad: conceptos y criterios de medición en Y. Guadin & R. Padilla Pérez (Eds.), *Nuevas narrativas para una transformación rural en América Latina y el Caribe: Hacia una medición y caracterización renovada de los espacios rurales* (pp. 25-54). CEPAL. <https://www.cepal.org/es/publicaciones/67977-nuevas-narrativas-transformacion-rural-america-latina-caribe-medicion>

Giraldo, O. F. (2015). Agroextractivismo y acaparamiento de tierras en América Latina: una lectura desde la ecología política. *Revista Mexicana de Sociología*, 77(4), 637-662. <https://doi.org/10.22201/iis.01882503p.2015.4.52675>

Gober, P. (2010). Desert urbanization and the challenge of water sustainability. *Current Opinion in Environmental Sustainability*, 2(3), 144-150. <https://doi.org/10.1016/j.cosust.2010.06.006>

Gonzales-Comín, J. (2023). El regreso del capital al origen extractivo. Evolución de los procesos urbanos en la Amazonía norte ecuatoriana (2000-2018). *Revista Eure-Revista de Estudios Urbanos Regionales*, 49(146), 1-23. <https://doi.org/10.7764/Eure.49.146.02>

Gudynas, E. (2015). *Extractivismos. Ecología, economía y política de un modo de entender el desarrollo y la naturaleza*. CLAES-Centro Latino Americano de Ecología Social. <https://www.cedib.org/wp-content/uploads/2015/03/Extractivismos-Gudynas.pdf>

Harvey, D. (2004). *El nuevo imperialismo*. Ediciones Akal S.A.

Harvey, D. (2014). *Diecisiete contradicciones y el fin del capitalismo*. Instituto de Altos Estudios Nacionales del Ecuador (IAEN). Akal. <https://traficantes.net/sites/default/files/pdfs/Diecisiete%20contradicciones%20-%20Traficantes%20de%20Sue%C3%B1os.pdf>

Instituto Geográfico Nacional [IGN]. (15 de abril del 2025a). Mapa de ubicación y actividades extractivas en el Bajo Piura. Centro de Infraestructura de datos Geoespaciales- OEINFO. <https://www.idep.gob.pe/geovisor/VisorDeMapas-3D/>

Instituto Geográfico Nacional [IGN]. (15 de abril del 2025b). Mapa de la escala del riesgo en Sechura. Centro de Infraestructura de datos Geoespaciales- OEINFO. <https://www.idep.gob.pe/geovisor/VisorDeMapas-3D/>

Instituto Geográfico Nacional [IGN]. (15 de abril del 2025c). Mapa de la escala del riesgo en Cura Mori. Centro de Infraestructura de datos Geoespaciales- OEINFO. <https://www.idep.gob.pe/geovisor/VisorDeMapas-3D/>

Instituto Nacional de Estadística e Informática [INEI]. (2018). Piura, resultados definitivos. *Tomo I. Cuadros estadísticos de población en Resultados Definitivos de Los Censos Nacionales 2017. PIURA* https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1553/

Instituto Nacional de Estadística e Informática [INEI]. (2026). *Perú: Evolución de la pobreza monetaria 2016-2025. Informe Técnico*. Gob.pe. <https://cdn.www.gob.pe/uploads/document/file/9911812/8088591-peru-evolucion-de-la-pobreza-monetaria-2016-2025.pdf?v=1777997141>

Jimenez Arévalo, A. C. (7 de abril de 2024). *Comuneros denuncian presunta posesión "ilegal y engañosa" de tierras en Cura Mori*. Cutivalú. <https://archivo.cutivalu.pe/comuneros-denuncian-posesion-ilegal-y-enganosa-de-tierras-de-cura-mori/>

Leff, E. (2004). *Racionalidad ambiental. La reapropiación social de la naturaleza*. Siglo XXI Editores S.A. https://ru.iis.sociales.unam.mx/bitstream/iis/4937/1/Racionalidad_ambiental.pdf

Lefebvre, H. (1974). *La producción del espacio*. *Papers. Revista de Sociología*, 3, 219–229. <https://doi.org/10.5565/rev/papers/v3n0.880>

Ley N° 30556 del 2017. Por la cual se aprueban disposiciones de carácter extraordinario para las intervenciones del gobierno nacional frente a desastres y que dispone la creación de la Autoridad para la Reconstrucción con Cambios. 29 de abril 2017. Normas legales, diario El Peruano. <https://www.gob.pe/institucion/congreso-de-la-republica/normas-legales/321277-30556>

Ministerio de Desarrollo Agrario y Riego [MIDAGRI]. (s.f.). Catastro rural (visor de mapas). <https://www.arcgis.com/apps/instant/sidebar/index.html?appid=5cf67ec46e1d46ae9bf706aed64049a4>

Ministerio del Ambiente [MINAM]. (2014). *El Fenómeno El Niño en el Perú*. <https://sinia.minam.gob.pe/documentos/fenomeno-nino-2015>

Ministerio de Vivienda, Construcción y Saneamiento [MVCS]. (27 de marzo de 2019). *Documentos Técnicos para Elaboración de los PLANES, en el marco de la "Reconstrucción con Cambios" del Ministerio de Vivienda, Construcción Y Saneamiento*. Gob.pe <https://www.gob.pe/institucion/vivienda/informes-publicaciones/270340-documentos-tecnicos-para-elaboracion-de-los-planes-en-el-marco-de-la-reconstruccion-con-cambios-del-ministerio-de-vivienda-construccion-y-saneamiento>

Ministerio de Vivienda, Construcción y Saneamiento [MVCS]. (2020a). Plan de Acondicionamiento Territorial PAT Piura 2020-2040. Informe sobre la participación ciudadana en la validación y socialización del Estudio. Dirección General de Políticas y Regulación en Vivienda y Urbanismo. Municipalidad Provincial de Piura. <https://sites.google.com/vivienda.gob.pe/planes-rcc-dgprve/pat-piura>

Ministerio de Vivienda, Construcción y Saneamiento [MVCS]. (2020b). *Plan de Desarrollo Urbano Cura Mori – El Tallán, 2020-2030. Tipo 1. Informe sobre la*

participación ciudadana en la validación y socialización del Estudio. Dirección General de Políticas y Regulación en Vivienda y Urbanismo. Municipalidad Distrital de Cura Mori-El Tallán. <https://sites.google.com/vivienda.gob.pe/planes-rcc-dgprvu/pdu-tall%C3%A1n-curamori?autuser=1>

Ministerio de Vivienda, Construcción y Saneamiento [MVCS]. (2023). *Plan de Desarrollo Urbano Sechura, 2020-2030*. Municipalidad Provincial de Sechura. <https://www.gob.pe/institucion/munisechura/informes-publicaciones/4458492-plan-de-desarrollo-urbano>

Pérez-Martínez, M. E. (2016). Las territorialidades urbano-rurales contemporáneas: Un debate epistémico y metodológico para su abordaje. *Bitácora Urbano Territorial*, 26(2), 103-112. <http://dx.doi.org/10.15446/bitacora.v26n2.56216>

Municipalidad distrital de Cura Mori. (2020). *Plan de prevención y reducción del riesgo de desastres del distrito de Cura Mori, 2020-2022*. Sistema de Información para la Gestión del Riesgo de Desastres [SIGRID]. <https://sigrid.cenepred.gob.pe/sigridv3/documento/9822>

Revesz, B. & Oliden, J. (2011). Piura: Transformación del territorio regional. *Revista Ecuador Debate*, (84), 151-176. <http://hdl.handle.net/10469/3597>

Santos, M. (2000). *La naturaleza del espacio: técnica y tiempo, razón y emoción*. Ariel Geografía.

Sassen, S. (2015). *Expulsiones. Brutalidad y complejidad en la economía global*. Katz Editores. <https://urbanitasite.wordpress.com/wp-content/uploads/2020/01/sassen-expulsiones-brutalidad-y-complejidad-en-la-economia-c81a-global.pdf>

Servicios de Comunicación Intercultural- SERVINDI. (14 de marzo de 2023). *Concesiones en el bajo Piura: el caso de Sechura y La Unión*. <https://www.servindi.org/actualidad-noticias/13/03/2023/concesiones-en-el-bajo-piura-el-caso-de-sechura-y-la-union>

Swampa, M. (2013). "Consenso de los Commodities" y lenguajes de valoración en América Latina. *Nueva Sociedad* (244), 30-46. <https://nuso.org/articulo/consenso-de-los-commodities-y-lenguajes-de-valoracion-en-america-latina/>

Swyngedouw, E. (2010). *Place, Nature and the Question of Scale: Interrogating the Production of Nature*. Diskussionspapier 5. BBAW/Interdisziplinäre Arbeitsgruppe Globaler Wandel. https://edoc.bbaw.de/opus4-bbaw/frontdoor/deliver/index/docId/859/file/diskussionspapier_5_swyngedouw_online.pdf

X. ACKNOWLEDGMENTS

To the Research Institute of the Faculty of Architecture, Urbanism and Arts, National University of Engineering (INIFUA), Lima, Peru, for the financing provided for this study within the framework of the project "Socio-environmental transformations and socio-spatial restructuring on the coast of the Piura region: Challenges for sustainable development planning in the face of the "El Niño Phenomenon and capitalist urbanization" (Decanal Resolution No. 056-2022 FAUA-UNI of March 3rd, 2022). This article presents part of the results of the aforementioned research.

MOBILITY MOTIVES AND PRACTICES TO ACCESS SERVICES IN LATIN AMERICAN CONTEXTS: A REINFORCEMENT OF CENTRALIZATION IN THE CITIES OF SOUTHERN CHILE ¹

MOTIVOS Y PRÁCTICAS DE DESPLAZAMIENTO PARA EL ACCESO A SERVICIOS EN CONTEXTOS LATINOAMERICANOS: UN REFUERZO DE LA CENTRALIZACIÓN EN LAS CIUDADES DEL SUR DE CHILE

FRANCISCO RAMÓN MATURANA-MIRANDA ²
FERNANDO ANDRÉS PEÑA-CORTÉS ³
SERGIO SOZA-AMIGO ⁴
JORGE EDUARDO CÁRDENAS-PIZARRO ⁵

- 1 Fondo Nacional de Desarrollo Científico y Tecnológico FONDECYT Regular N°1230159 "Modelación prospectiva de los servicios básicos en asentamientos humanos del Sur de Chile. Propuestas para su gestión territorial" y FONDECYT Regular N°1221931 "Repensando el Ordenamiento Territorial en Chile: Conocimiento local y mapuche y escenarios co-construidos para la toma de decisiones sostenibles".
- 2 Doctorado en Planificación Regional, Urbanismo y Dinámica Espacial
Profesor Asociado, Instituto de Ciencias de la Tierra
Universidad Austral de Chile, Valdivia, Chile
<https://orcid.org/0000-0003-3963-5807>
francisco.maturana@uach.cl
- 3 Doctorado en Ciencias Ambientales
Profesor titular, Laboratorio de Planificación Territorial,
Departamento de Ciencias Ambientales, Facultad de Recursos Naturales
Universidad Católica de Temuco, Temuco, Chile
<https://orcid.org/0000-0002-0489-1555>
fpena@uct.cl
- 4 Doctorado en Economía Aplicada
Profesor titular, Instituto de Gestión e Industria
Universidad Austral de Chile, Valdivia, Chile
<https://orcid.org/0000-0002-8256-6782>
sergio.soza@uach.cl
- 5 Geógrafo
Profesional de Apoyo, Laboratorio de Transiciones Territoriales de la Zona Sur y Austral
Universidad Austral de Chile, Valdivia, Chile
<https://orcid.org/0000-0003-2815-9489>
jorge.cardenas_pizarro@stud.uni-heidelberg.de

<https://doi.org/10.22320/07183607.2026.29.53.06>



La concentración de la población en capitales regionales y el papel de éstas en la división político-administrativa generan asimetrías en el equipamiento urbano y en la oferta de servicios. En este contexto, los habitantes de ciudades de menor tamaño se ven obligados a desplazarse hacia centros urbanos mayores para satisfacer diversas necesidades, lo que produce efectos diferenciados en los territorios de origen y destino. Este estudio analiza, a partir de una encuesta aplicada a 766 personas residentes en ciudades pequeñas y medianas, los motivos, niveles de confort, gasto y tiempos de desplazamiento asociados a la búsqueda de servicios hacia Temuco y Valdivia, dos capitales regionales del sur de Chile que han experimentado procesos de metropolización. Los resultados indican que al menos el 60% de los desplazamientos supera una hora de duración y que el transporte público es el medio más utilizado, evidenciándose, además, una heterogeneidad en los motivos de viaje. Estos hallazgos permiten visibilizar los procesos de movilidad en el marco de ciudades en transición hacia la metropolización como un componente clave en las orientaciones de la Política Nacional de Ordenamiento Territorial, particularmente en relación con la accesibilidad y su operacionalización a través del Sistema de Indicadores y Estándares Territoriales (SIET-Chile)

Palabras clave: accesibilidad, servicios básicos, transporte, jerarquía urbana, desplazamientos

The concentration of the population in regional capitals, along with their role in the political-administrative division, generate asymmetries in urban infrastructure and service provision. In this context, residents of smaller cities are often compelled to travel to larger urban centers to meet various needs, producing differentiated effects in both origin and destination areas. This study analyzes, based on a survey of 766 residents of small- and medium-sized cities, the motivations, comfort levels, expenses, and travel times associated with accessing services in Temuco and Valdivia, two regional capitals in southern Chile that have undergone processes of metropolitanization. The results indicate that at least 60% of trips take over an hour, that public transportation is the most commonly used mode, and that travel purposes show significant heterogeneity. These findings highlight mobility processes in cities undergoing metropolitanization as a key component in guiding the National Regional Planning Policy, particularly for accessibility and its operationalization through the System of Territorial Indicators and Standards (SIET-Chile).

Keywords: accessibility, basic services, transportation, urban hierarchy, trips

I. INTRODUCTION

Territories have been profoundly transformed by neoliberalism and globalization, reconfiguring socio-spatial dynamics and generating new urban centralities, as well as an increase in different flows (De Mattos, 2010; Zurbano, Bidaurrezaga & Martinez, 2014; Beuf, 2020; Soza-Amigo, Parada & Cholera, 2023). This integration has intensified the movement of people, goods, ideas, and capital, affecting cities locally and globally and causing changes at both macro- and micro-urban levels (Sheller & Urry, 2016; Kara, 2019). As a result, cities have experienced heterogeneous growth, giving rise to differently sized but unequally geographically distributed cities with similar needs (Liu et al., 2021). This process has occurred within a context of asymmetries and increasing demands for basic services such as energy, water, health, and transport, which are stressing urban infrastructure and can aggravate existing inequalities (Guo & Ma, 2023; He et al., 2022).

Thus, differences in population distribution involve asymmetries in the provision and development of services. It is in this context that challenges emerge in the medium-sized cities of South America, due to their intermediate position between urban poles and rural areas, and within the urban systems in which they are embedded (Maturana Miranda & Montoya, 2021; Chávez et al., 2008). In that way, the cities within urban systems express an important part of diffuse, fragmented and segregated peri-urban expansion (Ubilla-Bravo & Mardones Cáceres, 2024), but one unaccompanied by a relevant battery of services that promotes greater mobility and limits the benefits from the specialization or diversification of cities' economic roles (Maturana Miranda, Peña-Cortés & Ortiz Nova, 2024).

As a result, this leads to a lack of basic services that is strongly intertwined with territorial inequality and expressed at the housing level through a lack of access to water, sanitation, and electricity. In this regard, the Economic Commission for Latin America and the Caribbean [ECLAC] (2022) has emphasized that, in Latin America, vulnerability tends to be greater in rural areas due to weaknesses in infrastructure, not only in water and sanitation, but also in other basic services, deficiencies that are linked to social exclusion and limitations for development.

In Chile, urban development has been a dynamic process similar to that observed in other medium-sized cities in South America (Maturana et al., 2017). However, this evolution has not significantly improved access to basic services; rather, it has generated high levels of dependence and displacement from smaller areas

to larger urban centers (Maturana et al., 2017). It is in this sense that accessibility has become a core issue for evaluating urban sustainability (Rojas, Vecchio & Ladrón de Guevara, 2024), in line with the Sustainable Development Goals [SDGs] that establish the provision of basic services by 2030 as a fundamental aspect for national development (Ministry of Social Development and Family of Chile, 2025).

The National Urban Development Policy of Chile, passed in 2014 and currently being updated, established the definition of Urban Public Goods [BPU, in Spanish] and created the Urban Development Standards Indicator System [SIEDU, in Spanish] to measure and monitor progress towards more sustainable and equitable cities, aligned with the Sustainable Development Goals (Ministry of Housing and Urbanism, 2014; Hidalgo Dattwyler et al., 2021). At the same time, and within the framework of the National Rural Development Policy, the System of Indicators of Rural Quality of Life [SICVIR, in Spanish] was created to assess gaps and inequalities in access to basic services in non-urban areas. Both were later systematized in the new System of Territorial Indicators [SIET, in Spanish], which seeks to provide relevant information for both urban and rural policy, within the framework of the National Territorial Planning Policy [PNOT, in Spanish].

However, despite these policies and monitoring mechanisms being in place, gaps in the available details hinder understanding of the challenges of accessing essential services such as drinking water, sanitation, education, and health. Significant challenges also persist in their equitable provision, especially for vulnerable groups, which include a growing housing deficit (United Nations Peru, 2021; Centro de Estudios Techo Chile, 2024). In fact, in the educational field, although the State has led various initiatives to improve the quality and equity of the system, inequalities persist, particularly in rural areas and smaller cities (Basulto Gallegos, Castro Cáceres & Jara Jara, 2023; González, 2017), all of which warrant understanding. In health, although the universal coverage system reaches a significant share of the population, gaps in equitable access persist (especially in rural areas and among vulnerable groups), and significant differences remain between public and private care (Ministry of Health of Chile, 2022).

Therefore, despite efforts to understand accessibility levels, many scales of analysis do not consider smaller urban spaces or cities undergoing metropolization (Rojas, Vecchio & Ladrón de Guevara, 2024). In this context, the cities of Temuco and Valdivia, the regional capitals of the La Araucanía and Los Ríos Regions, located 600

and 800 km south of the capital, Santiago, respectively, are relevant cases to analyze due to their population concentration and their locations within their respective areas of influence. The first (Temuco), with around 373,174 inhabitants, accounts for approximately 37% of the region's population, while Valdivia, with 170,043, accounts for 42% (National Institute of Statistics of Chile [INE], 2024). In addition, this population concentration, beyond its magnitude, is not related to its spatial location, as shown in Figure 1: Temuco is central, located next to the dual-carriageway southern route 5. Meanwhile, Valdivia is coastal and has limited access via single-lane roads.

Despite the relevance of these regional capitals, the characteristics of journeys within their spheres of influence, the reasons behind them, and the resulting spatial model remain insufficiently documented. This article aims to analyze the reasons and some effects of the inhabitants' movements in these regions, where dependency relationships and practices associated with access to basic services in urban-rural contexts are made clear. The question is posed: how are these journeys, their reasons, times, and comfort structured, and what effects do these movements have on the population living in smaller cities in search of basic services? This question falls within the analysis of interurban displacement dynamics linked to the centralization of urban services, a phenomenon that directly affects the functional relationships between cities of different sizes. It is also related to the validity and materialization of the principles established in the National Territorial Planning Policy, particularly their connection between urban and rural areas, with a focus on smaller cities in southern Chile.

II. THEORETICAL FRAMEWORK

Accessibility and its components

Accessibility has become a fundamental process that triggers displacement dynamics or pendulum movements in Latin America. These dynamics are explained by the asymmetries in the distribution of the population within urban centers, which promote interurban journeys and even the expansion of these centers, particularly in metropolitan areas, where movements are generated within their areas of influence (Riquelme, Saravia & Azócar, 2019; Lobo & Cunha, 2019; Tiznado-Aitken et al., 2023).

Accessibility has been classically defined as how easily one or more individuals can move from their origin to a destination. However, this conception, focused on measuring distances and travel times, tends to reduce

the phenomenon to a purely functional dimension of displacement. From a broader perspective, accessibility refers to the spatio-temporal constraints that structure everyday life and shape the real possibilities for social interaction. In this sense, it depends not only on the distance to the demand and its size (Harris, 1954), but also on historically produced territorial configurations that unevenly distribute opportunities and services.

In an attempt to overcome strictly metric approaches, Geurs and Van Wee (2004) propose a multidimensional conceptualization based on four interrelated components: land use, the transport system, the temporal dimension, and the individual component. However, from a critical perspective, these components do not operate neutrally but reflect power relations, socio-economic inequalities, and differentiated capacities for appropriating and using practices, as they are reflected in space. The location of activities (land use) responds to market and planning logics that privilege certain areas; transport infrastructure materializes political decisions and budgetary priorities; temporality expresses labor and organizational systems that do not affect everyone equally; and the individual component is linked to unequally distributed economic, social, and cultural capitals (Soza-Amigo et al., 2023).

The urban hierarchy: A key element in population distribution

Accessibility and journeys within the area are closely linked to inequalities in the population's spatial distribution, where notions of urban hierarchy and asymmetric centralities become relevant. The hierarchy refers to the differential population magnitudes within territories and, far from being an anomaly, represents a structural regularity of urban systems: certain cities tend to concentrate a significantly higher proportion of the population than others and to reproduce this inequality over time (Pumain & Saint-Julien, 2014). The same applies to countries in Latin American contexts (Maturana Miranda & Montoya, 2021).

In this framework, urban systems have a pyramidal organization: there is a broad base of numerous low-population urban centers, while towards the top, the number of cities decreases sharply, although these concentrate a substantial proportion of the total population. This configuration not only describes a demographic structure but also expresses a logic of concentration of functions, resources, and opportunities associated with the laws of scale and development possibilities (Bettencourt et al., 2007; Pumain et al., 2006). Consequently, population size becomes a determining factor in the material and immaterial viability of certain services, particularly in domestic contexts where the

State's redistributive and planning capacity is limited, leading to unequal socio-economic benefits for cities according to size and growth (Arvidsson, Lovsjö & Keuschnigg, 2023).

Medium-sized or intermediate cities

The size of cities, measured by population, becomes relevant and prompts reflection on the distinction between medium-sized and intermediate cities. The first is associated with a statistical notion, while the second places greater emphasis on dynamic aspects, such as strategy, urban positioning, mediation, and synergies. According to Bellet Sanfeliu and Llop Torné (2004), a city's potential would not depend on its population size; rather, its importance would lie in its ability to generate relationships and integrate into the urban network.

This definition of intermediate cities is linked to European contexts, where this concept emerged and where the possibilities for well-being offered by States, associated with much denser occupations (consider the approximately 36,000 French communes), give these cities greater relevance and capacities for interaction and insertion. However, in Latin America, this notion is not fully applicable and has been used exclusively in analyses and case studies of non-metropolitan spaces, without explicitly questioning the notions of size and intermediation (Maturana et al., 2017).

Thus, the definition of medium-sized or intermediate cities is limited to the urban system in which they are immersed. Regardless of the territorial system in which they are situated, which implies their classification, these cities play a fundamental role in the organization of urban systems, albeit with differentiated roles. In fact, this city could be an average-sized city in a rural, more peripheral environment, close to a metropolitan area or an intermediate one between the metropolitan and the rural, providing different supply roles (Dehne et al., 2023; Mary-Portas & Bertrand, 2017).

Medium-sized cities close to metropolitan areas tend to have high levels of dependency (possibly mutual in some cases) and to favor intense pendular and economic flows. This means that their development begins to be subordinated (and vice versa) through the configuration of highly connected polycentric metropolitan spaces (Santamaria, 2012). For example, the availability of land for new housing is frequently materialized in these medium-sized cities. However, it is not always accompanied by a complete set of associated services, particularly when the metropolitan area is not highly consolidated, as is the case in Santiago de Chile (Ubilla-Bravo & Chia, 2021).

III. METHODOLOGY

In this study, a quantitative design was adopted using cluster sampling, which involves selecting a sample from defined spatial units and their subsets, making it more efficient and much less expensive (Otzen & Manterola, 2017; Ríos Calderón, 2022). Two criteria were used to define the cities' sample units: first, the proximity to the regional capitals, Temuco (La Araucanía) and Valdivia (Los Ríos), established by a buffer of 60 km in QGIS based on road map data of 2017 from the Ministry of Public Works of Chile; secondly, the role of provincial capital and the location in communes further from the regional capital. Regarding the first criterion, the choice of this distance is based on the available time for a daily commute, which is around an hour or an hour and a half at most (Guérois et al., 2016; Pumain, Bretagnolle & Degorge-Lavagne, 1999).

23 urban entities were selected, 12 in the Araucanía Region (37.5%) and 11 in the Los Ríos Region (91.6%) (see Figure 1). For these cities, an intercept survey was conducted during the morning in high-mobility public places, such as Plazas de Armas (main town squares) and public transport stops, between October and November 2023 (Antolín et al., 2015; Sperry et al., 2012). The questionnaire, based on the INE instrument (2018), included questions about equipment and access at home, reasons and places of expenditure, frequency and means of travel, among other aspects (see Appendix 1). The sample was determined using simple random sampling, considering inhabitants older than 20 years old according to INE's 2017 census (2017), with populations of 150,176 and 157,256 for La Araucanía and Los Ríos, respectively, and a confidence level of 95% with a margin of error of 5%, following the method described by Hernández-Sampieri and Mendoza (2018). The equation to determine the sample is presented below (Equation 1):

$$n = (Z^2 \cdot p \cdot (1-p)) / e^2 \quad (\text{Equation 1})$$

Where:

n = the sample size.

Z = confidence level.

e = desired margin of error.

p = the proportion that one wishes to measure.

When applying this formula, it was estimated that 383 surveys per region were needed for people aged over 20. Subsequently, a second formula was applied to obtain a population factor and thus estimate the number of surveys per city (Equation 2):

$$n' = n / P_{\text{obT}} \quad (\text{Equation 2})$$

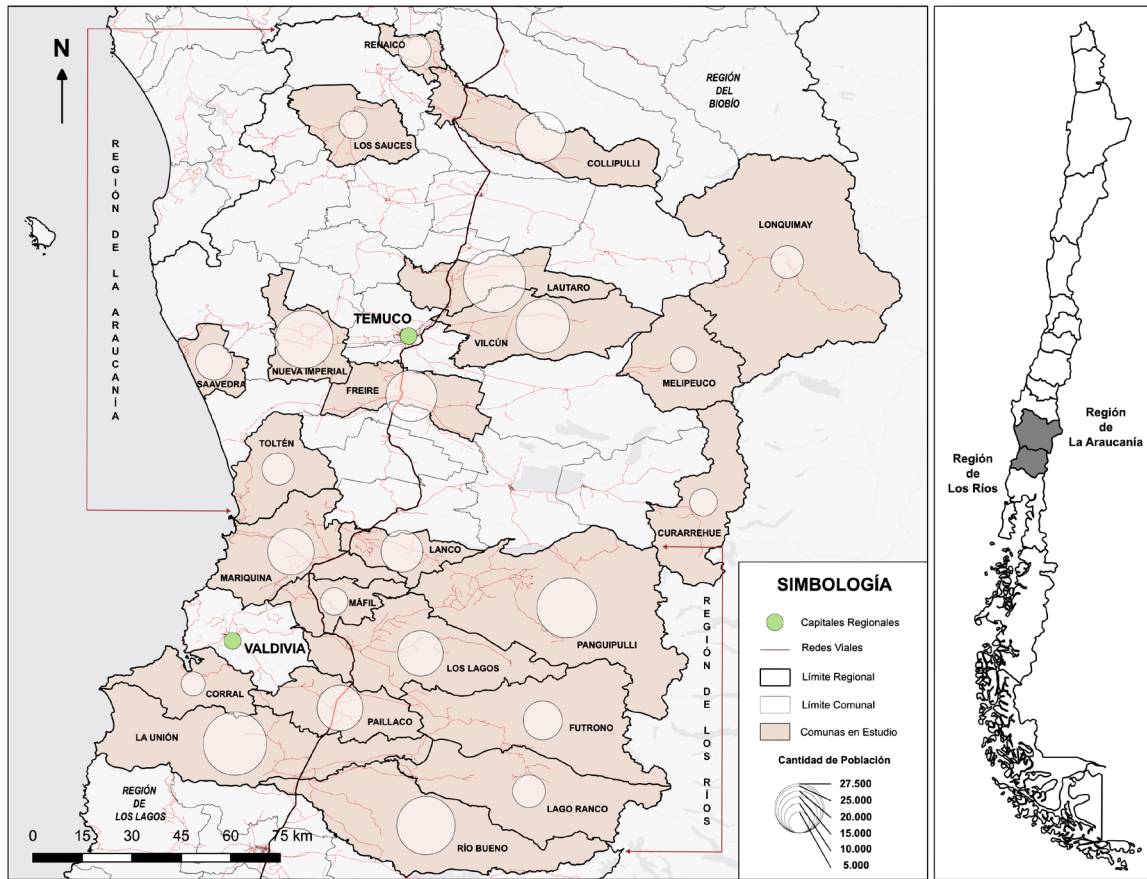


Figure 1. Study area in the La Araucanía and Los Ríos regions. Source: Prepared by the authors.

Where:

n' = population factor.

n = the sample size.

PobT = total population.

When obtaining the factor, reflected in Equation 2, Equation 3 is applied to obtain the number of surveys to be carried out per spatial unit (estimation of the population factor):

$$n'' = (\text{PobC}_i) * n' \quad (\text{Equation 3})$$

Where:

n'' = number of surveys.

PobC_i = population of each city.

n' = factor.

For this research, 766 surveys were administered across the cities and towns of each region, as shown in Figure 1. For the analysis, simple frequencies and contingency tables

were calculated, and a Multiple Correspondence Analysis [MCA] was applied. The R programming language and the FactoMineR library were used (Husson et al., 2023). It was considered to apply an ACM, since it is a multivariate statistical technique that allows exploration and visualization of the relationships among categorical variables by representing them on a factorial plane. This method allows identifying association patterns between categories, as well as the "proximity" or "distancing" between the individuals surveyed based on their answers, categorizing them according to their similarities. In this way, the ACM allows summarizing large sets of qualitative information by projecting both variables (questions asked to people) and individuals (people) into the same factor space, which facilitates the interpretation of underlying structures in the data and detecting behavioral profiles or groupings. According to Husson, Lê and Pagès (2017), this technique is especially useful in social and regional studies where categorical variables from surveys or questionnaires predominate, since it

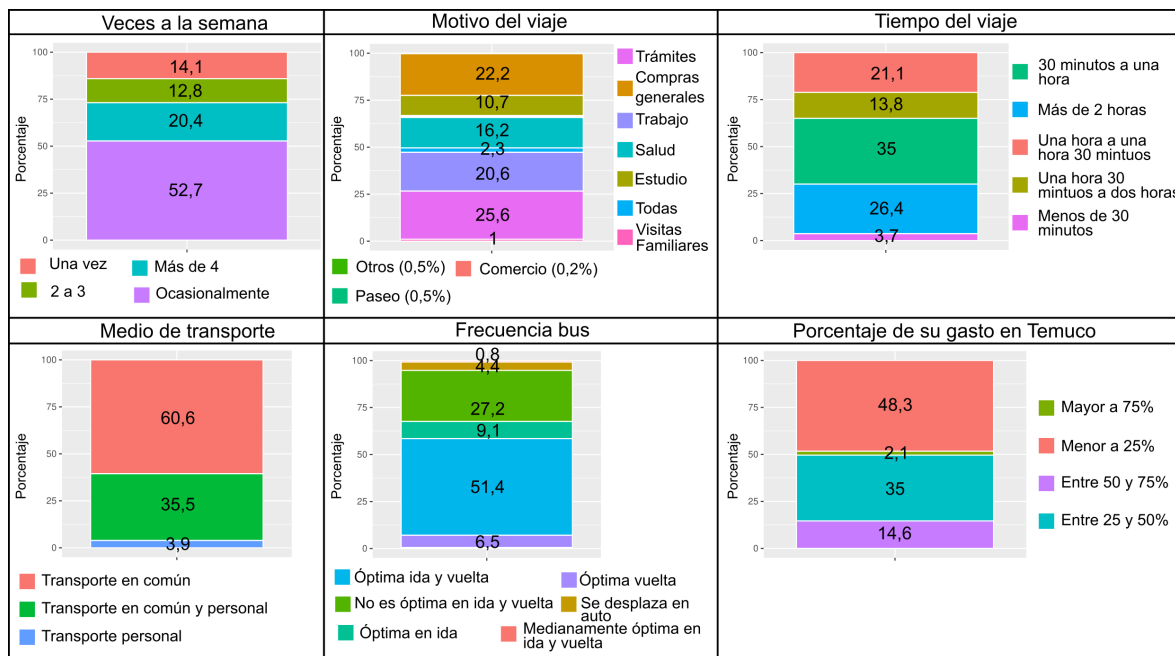


Figure 2. General results of the survey applied in cities around Temuco. Source: Prepared by the authors.

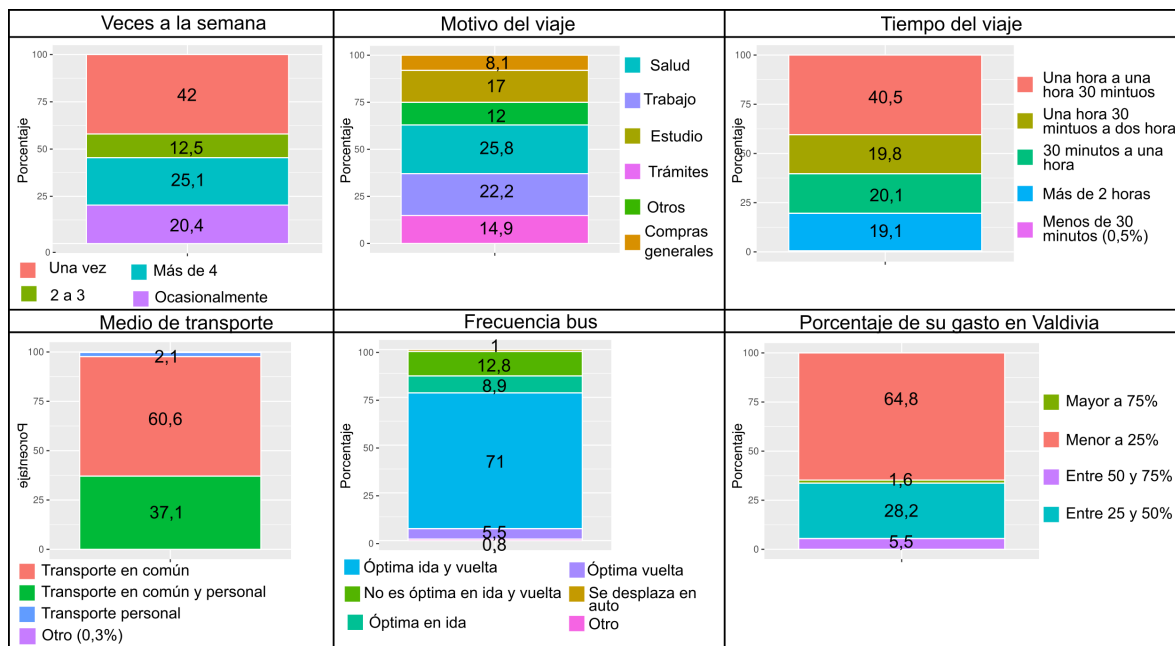


Figure 3. General results of the survey applied in cities around Valdivia. Source: Prepared by the authors.

allows multiple dimensions of the data to be analyzed simultaneously and to understand the relationships between them in an exploratory and visual way. In this sense, it has been applied for survey research in Latin American contexts such as Lamfre, Perren, and Bramardi (2023) for Argentina regarding quality of life; in addition to being applied in other areas in surveys associated with health or consumption (Bécue-Bertaut & Pagès, 2008; Bejaei, Cliff, & Singh, 2020; Muda & Ahmad Raphaie, 2025). The resulting ACM graphics were later redesigned with the open-source vector graphics editor Inkscape.

IV. RESULTS

Figures 2 and 3 summarize the journey frequencies in Temuco (La Araucanía Region) and Valdivia (Los Ríos Region). In Temuco, 52% of trips are occasional, while the remaining 48% travel at least once a week, with 20.4% doing so four or more times a week. The main reasons are for services and work, with errands (25%), health (16.2%), work (20.6%), and general purchases (22%) standing out. Travel times usually exceed 30 minutes, with more than 60% of trips lasting over an hour and 26% over two hours. Transport alternates between bus and personal vehicle, with the bus being the most used; half of the respondents consider the frequency optimal, although 27% rate the quality as low. Finally, at least half allocate more than 25% of their income (excluding housing) to these trips, reflecting the intensity and cost of travel.

In the Los Ríos Region, Valdivia is a coastal city and less central than Temuco. This does not significantly alter the journey logic, since 42% of people travel weekly to Valdivia and, adding other frequencies, 80% make trips with some regularity, similar figures to those of the Araucanía Region for Temuco. The reasons for these journeys are mainly access to goods and services, as well as pendular movements for work or university studies, although the category of "other" reasons also appears. In terms of travel time, location and infrastructure have a significant influence, since 60.6% of trips exceed one hour, including 40.5% that last between one and one and a half hours or more, as well as trips of two hours or more.

Regarding the means of transport and frequency, only the latter varies in Valdivia, where there is a better perception: 71% declare it optimal for round trips. The cost is lower than in Temuco. In fact, the inhabitants of the Los Ríos Region would rather spend a significant part of their expenses in their cities and, in the capital, Valdivia, only about 35%.

Figures 2 and 3 show, in general terms, the dynamics of population movements to access goods and services, but when analyzing the relationships between variables and the sample's behavior, other processes emerge. Figures 4, 5, and 6, the result of the ACM supplemented with the crossing of variables, reveal that the first two dimensions explain about 8% and 6% of the variance (14% in total), low values that reflect the complexity of establishing clear relationships given the nature of the variables surveyed. However, Figure 4 provides relevant information on the similarities and differences between response categories and variables as perceived by individuals.

In particular, for Araucanía, the first two dimensions explain 14.27% of the total variability in the data (Dimension 1: 8.17%; Dimension 2: 6.10%). The first dimension is strongly structured by variables associated with the intensity (Times per week) and reason for the trips to Temuco. In particular, the reason for the trip has the greatest association with this dimension ($R^2 = 0.77$; $p < 0.001$), times per week ($R^2 = 0.66$), the work or occupation of the respondents (a) ($R^2 = 0.52$), and the city of residence ($R^2 = 0.42$). Travel time ($R^2 = 0.38$), age ($R^2 = 0.32$), and educational level ($R^2 = 0.30$) also contribute. The categories that characterize the positive end of the axis are mainly for individuals who travel to Temuco for study purposes, travel more than 4 times a week, are aged 18 to 25, have incomplete technical or university education, and travel for 30 minutes to 1 hour. In contrast, the negative end of the axis is associated with occasional trips, trips motivated by health or errands, longer travel times (more than two hours), and older age groups.

On the other hand, the second dimension mainly concerns accessibility conditions and the means of transport used to reach Temuco. In this axis, the frequency of the bus ($R^2 = 0.60$) and the means of transport ($R^2 = 0.53$) stand out as the variables with the greatest explanatory capacity, followed by the level of education ($R^2 = 0.25$), the reason for the trip ($R^2 = 0.27$), and the services accessed in the city ($R^2 = 0.44$). The positive end of the axis is characterized by personal transportation, employment, and trips occurring approximately once a week, as well as vocational or university education levels. In contrast, the negative extreme is associated with the use of public transport, occasional trips, lower educational levels (incomplete primary or secondary education), lower transport spending, and trips motivated by health reasons. Altogether, these dimensions indicate that trips to Temuco in the region are structured mainly by the frequency and purpose of the trip, as well as by differences in means of transport and access conditions to the city.

In the case of the Los Ríos region, trips to Valdivia are mainly organized by purpose and frequency. The first

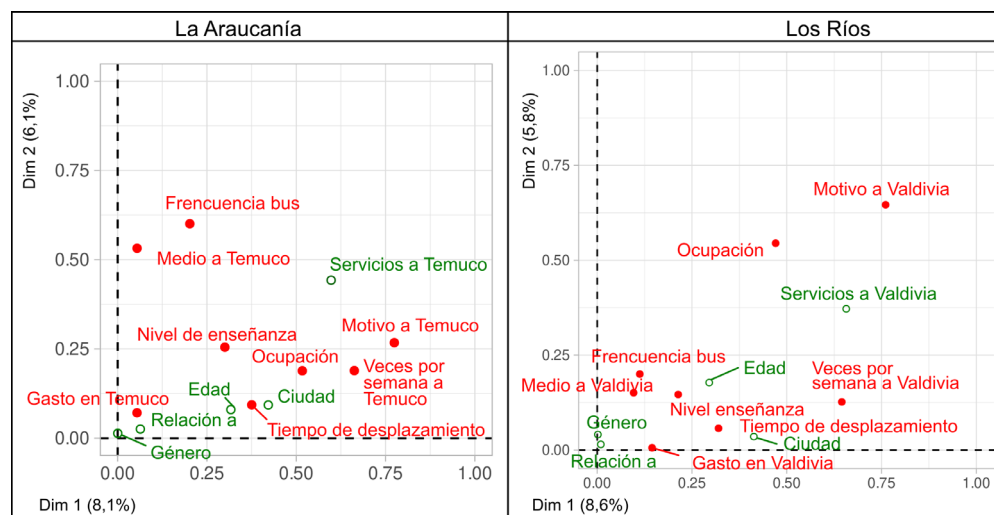


Figure 4. Representation of variables in the factorial planes. Source: Prepared by the authors.

dimension is strongly associated with the reason for the trip ($R^2 = 0.76$; $p < 0.001$), the weekly frequency of trips ($R^2 = 0.65$), access to services ($R^2 = 0.66$), and respondents' jobs or occupations ($R^2 = 0.47$). The city of residence ($R^2 = 0.41$), travel time ($R^2 = 0.32$), age ($R^2 = 0.30$), and educational level ($R^2 = 0.21$) also have relevant associations. The positive end of the axis is mainly characterized by occasional trips to Valdivia, associated with health reasons or errands for older people (51 years or older), with incomplete primary or secondary education, longer travel times (more than two hours), and lower transportation spending. These profiles are concentrated in more peripheral communes of the region, such as Panguipulli, Lago Ranco, and Futrono. In contrast, the negative end of the dimension is associated with frequent trips (more than four times a week), made mainly by young students (18-25 years old) with vocational education or university studies who move to Valdivia for study purposes and have shorter travel times.

On the other hand, the second dimension is mainly associated with the occupational situation and the work reasons for the journeys. In this axis, jobs (occupation) ($R^2 = 0.54$) and the reason for the trip ($R^2 = 0.65$) stand out as the most influential variables, followed by the frequency of the bus ($R^2 = 0.20$), age ($R^2 = 0.18$), the means of transport used ($R^2 = 0.15$), and educational level ($R^2 = 0.15$). The positive end of the axis is characterized by individuals who work and travel to Valdivia for work, usually two to three times a week, use personal transportation, and belong to intermediate age groups (26-50 years) with vocational or university education levels. In contrast, the negative extreme is associated with trips related to study or health, people who are retired or engaged in domestic work, the

elderly population, and the predominant use of collective transport. Altogether, these dimensions suggest that the trips to Valdivia are structured around two main dynamics: on the one hand, occasional trips associated with specific needs from more distant communes (or cities), and, on the other, more frequent trips linked to educational and work activities.

In comparative terms, the results of multiple correspondence analyses express similar patterns, but with some nuances. In both La Araucanía and Los Ríos, the first dimension is strongly shaped by the purpose of the trip and the frequency of trips to the regional capital, underscoring the central role of these cities as service hubs in their respective regions. However, while in La Araucanía the main dimension is associated more with frequent trips linked to educational activities, particularly among young people who travel several times a week, in Los Ríos the axis structure distinguishes more clearly between occasional trips associated with specific needs such as health or errands from peripheral communes and more regular trips. Also, in the second dimension, it is observed that in Los Ríos, work trips and occupational status carry greater weight in differentiating mobility patterns. In contrast, in Araucanía, differences in modes of transport and accessibility conditions are more relevant.

For their part, Figures 5 and 6 show, for each region, the survey questions and each individual's answers by category, plotted on a plane as a cloud of points, with each point corresponding to a respondent.

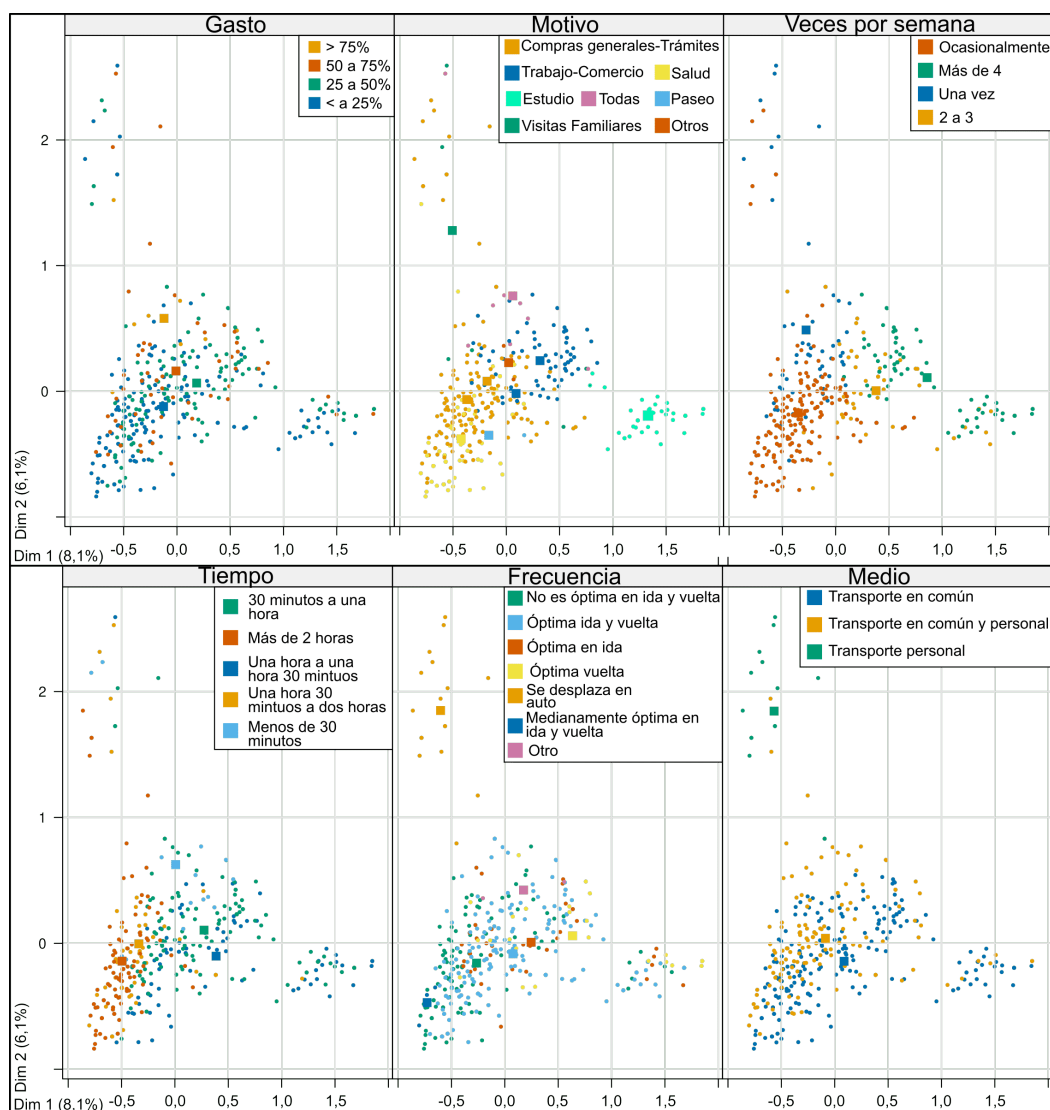


Figure 5. Confidence ellipses of the ACM results for the questions in the Araucanía Region regarding Temuco. Source: Prepared by the authors.

The results show that the points representing each individual are close when their responses to certain modalities or categories are similar, and the colored quadrants around indicate averages of related responses. In Figure 5, for the Region of La Araucanía, it is observed that groups of individuals with similar characteristics, such as those who spend less than 25% in Temuco, tend to prefer to run errands, make general purchases, or take occasional trips. An outstanding finding is that those who travel for study reasons are those who travel more often (more than four times a week), while those who travel for work show more

dispersed patterns, with trips varying between one and more than four times a week, which suggests a non-permanent work logic and raises reflections on modalities such as teleworking.

Figure 5 shows that general purchases, errands, or health reasons are associated with longer travel times, including occasional trips lasting between an hour and a half and more than two hours, indicating that the population is willing to travel for extended periods regardless of the service. Regarding the means of

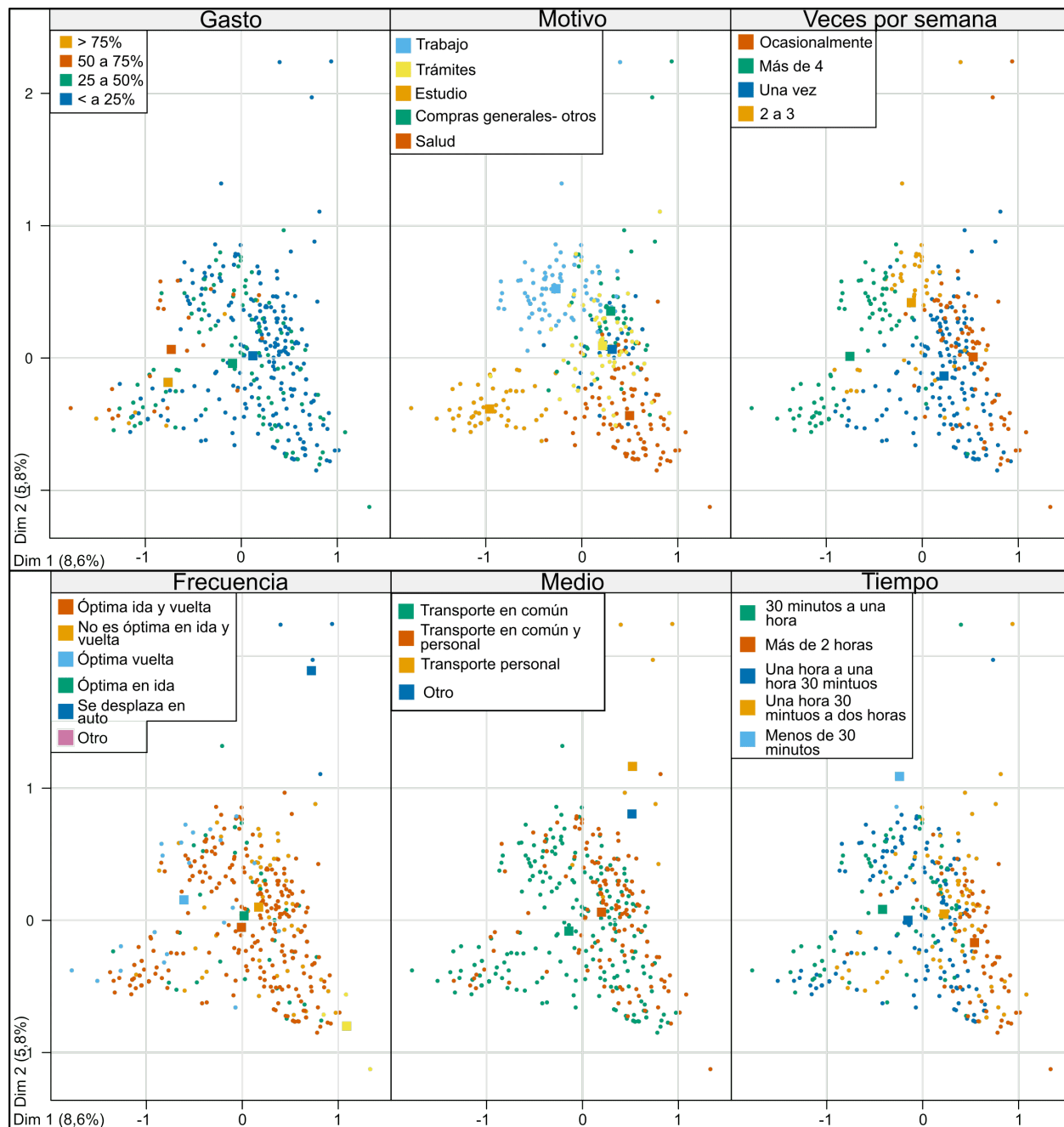


Figure 6. Confidence ellipses of the ACM results for the questions in the Los Ríos Region regarding Valdivia. Source: Prepared by the authors.

transport and frequency, no clear patterns are observed: those who travel for study tend to use public transport, whereas those who travel by car tend to travel less frequently, mainly for purchases or errands. In Valdivia, according to Figure 6, some outliers outside the main group are identified, though fewer than in La Araucanía, with no more than 5 cases.

The answers regarding the reason for the displacement, weekly frequency, and time show great heterogeneity across modalities. Similar to La Araucanía, in Los Ríos, 67% of those who study travel more than four times a week, while for work, this percentage is lower at 54%. In addition, those who travel for health reasons tend to do so less frequently: 61% travel once a week, and 31% occasionally. A smaller percentage of students alternate between public and private transport, a trend also observed in La Araucanía. Finally, it is highlighted that those who make longer trips tend to spend less, since 26% of individuals who travel at least an hour and a half allocate only 25% of their income to these trips, similar to the 25% who travel between one and one and a half hours.

V. DISCUSSION

Regarding the results, several aspects warrant discussion. The first is the sampling applied, particularly the number of surveys. Although the cluster method limits the analysis to an aggregate regional capital level and does not allow specific conclusions for each city, its application with limited resources has proven effective. It has been validated in previous studies (Bustamante, Cortés & Maturana, 2023). Therefore, the results obtained can be considered reliable and consistent with the methodological design, as they reflect general trends in displacement across both regions. The results also provide a valid basis for comparative analysis (between regions and their regional capitals) and for formulating aggregate-level interpretations.

Another aspect to be discussed is the logic behind the journey for the populations of smaller cities in the La Araucanía and Los Ríos regions, which follows a center-periphery pattern that reflects the polarization and regional concentration already documented (Maturana Miranda & Vial Cossani, 2011; Maturana Miranda & Arenas Vásquez, 2012; Riquelme-Brevis et al., 2019). Valdivia and Temuco have established themselves as metropolises that function as hubs of floating population by intensifying movements for work, study, health, and consumption, in line with processes observed in other Latin American cities that surpass the category of intermediate cities (Icazuriaga Montes & Osorio Franco, 2014).

These dynamics are practices similar to those of large metropolitan areas and their peripheries (Jirón & Mansilla, 2013), emphasizing the importance of urban size in development processes (Pumain et al., 2006; Zhao et al., 2024). The lengthy travel times and high costs also indicate that distance friction is less relevant to everyday travel needs (Pumain & Saint-Julien, 2014). Although lengthy times are expected in intercommunal journeys, it is notable that for activities such as general shopping or health, some cases have recurrence and high times, which contravene the standards of the National Urban Development Policy and the National System of Indicators and Territorial Standards, SIET Chile. This situation coincides with observations in OECD countries, where rural areas tend to have longer travel times (Mseke, Jessup & Barnett, 2024).

On the other hand, another little-discussed aspect concerns the profile of those who travel for work reasons. For example, it has been found that, in Norte Chico, the reasons for traveling are very different from those in the south; these, for the former, are based on employment and gender, while, for the latter, they are due to salary, gender, quintile, and type of coexistence. In addition, sales would be another reason to travel for work. Hence, a city that sells more products or services in a base year attracts people to work there the following year. The interesting thing about this aspect is that smaller localities that offer high salaries achieve an inverse effect: they attract people and do not send them to larger centers (Soza-Amigo et al., 2023).

In this line, in light of the results obtained, it is evident that mobility for work or study purposes is the most relevant; however, travel associated with services or health also holds high importance, yet it is relatively less visible. In this sense, several studies in Latin America (Hernández & Rossel, 2015; Marinho, Dahuabe & Arenas de Mesa, 2023) have begun to show the relevance of these mobility patterns, highlighting their impact on access to opportunities and the quality of life of the population.

This study presents the limitation of not considering the train as a means of transport in Temuco. Despite the positive evaluation of the Victoria-Temuco section (Riquelme Brevis et al., 2020), Valdivia does not offer this service. Commuting for work could become less frequent, inviting reflection on the growing impact of teleworking, accelerated by the pandemic (Ossa Cornejo et al., 2024). Although the sample may seem limited in terms of the number of cities, the surveys used proved very useful for understanding the dynamics of intra- and inter-urban mobility in Chile (Arevalo-Molina, Pérez-Bustamante & Villouta-Gutiérrez, 2023; Lazo et al., 2023).

Given that there have been no origin-destination surveys for intercommunal movements since 2002 (population census), beyond the release of data associated with the 2024 Census, future studies could provide relevant evidence in this area and contribute to updating the available knowledge. In this context, other surveys such as the ESI or CASEN have limitations for this type of analysis because they use different approaches in both the design of their questionnaires and the observation scales used in this research.

On the other hand, alternative methods such as the use of mobile phone data, although they have been applied in Chile and in other countries (Samaniego et al., 2020; Hadachi, Pourmoradnasseri & Khoshkhal, 2020; Louail et al., 2014; Zhuo et al., 2022), face significant restrictions associated with their coverage, updating and access, mainly due to current regulations on privacy and data use.

In this scenario, the limitations of the available information reinforce the relevance of the methodological approach adopted in this study and of its results, which provide empirical evidence in an area where data are scarce and difficult to access.

Finally, the new Regional Territorial Planning Plans [PROT], within the framework of Law 21.074 and its associated national policy, represent an opportunity to comprehensively analyze territorial connectivity and centrality by improving relations between regional settlements (Peña-Cortés et al., 2022). This is of utmost importance since the regulation of such instruments was approved in March 2026.

VI. CONCLUSIONS

Intercommunal displacements have been consolidated as a substantive process in the structuring and reconfiguration of interconnections that connect the network of cities. These territorial flows respond, to a large extent, to the population's need to access goods, services, and opportunities that are not available or are offered only in limited supply in their places of residence. Thus, the movements between cities, or pendular movements within their respective communes, not only constitute a recurrent socio-territorial practice but also serve as a structural component in the functional organization of the urban-regional system.

In this sense, the article's findings allow for the identification of at least three relevant processes. The first one shows that, despite increasing digital and technological advances that could reduce the need for physical journeys for certain services, the motivations associated with employment,

health, and education remain central and highly explanatory factors for most trips. This suggests that, although digitalization has transformed certain social and economic dynamics, it has not significantly replaced the need to travel in structural areas.

A second process, closely tied to the previous one, is largely explained by the strong concentration of employment and the diversity of the commercial and service offer in the regional capitals. This concentration reinforces the predominant role of these cities, in this case, Temuco and Valdivia, as articulating nodes for their respective regional systems. Both capitals polarize broad spheres of influence at the regional scale, configuring a highly centralized pattern of flows. This spatial model of displacement is maintained beyond the specific geographical location of these capitals, one located in a greater regional centrality and the other in a coastal location, which shows that functional centrality exceeds merely morphological or localization conditions. A third element refers to the need to problematize and question the development model implemented in smaller cities. The persistence and magnitude of these intercommunal journeys raise questions regarding the capacity of these cities to diversify their economic base and strengthen their service offer. From a spatial and public policy perspective, it is essential to reflect on how to articulate the interaction network among urban centers in a more balanced way to promote greater territorial complementarity and reduce the functional asymmetries that currently structure flows.

In this context, the accessibility dimensions discussed in the text referring to the service offer's location, the available transport infrastructure, the temporality of the journeys, and the strategies used by the inhabitants themselves to materialize them constitute key elements for the comprehensive understanding of the phenomenon. These factors have been considered in a structured manner in the design and implementation of public policies, such as the National Territorial Planning Policy and its rollout into Urban and Rural Policies. However, progress must be made not only to ensure access itself through displacement, but also to evaluate the appropriate conditions for comfort, equity, and quality in access.

Finally, and in line with this, these elements acquire special relevance within the framework of the objectives set by the National Territorial Planning Policy, whose guidelines are translated into specific strategies systematized in the recently updated Regional Development Strategies (RDS) of the analyzed regions. Consequently, understanding the spatial logic of intercommunal flows not only allows us to describe current territorial dynamics but also to provide substantive input for formulating policies aimed at more balanced, integrated, and sustainable territorial development, with a focus on access conditions.

VII. CONTRIBUTION OF AUTHORS CRedit:

Conceptualization, F.M., F.P.C., S.S.A.; Data Curation, J.C.; Formal analysis, F.M., S.S.A.; Acquisition of financing, F.M., F.P.C.; Research, F.M., F.P.C.; Methodology, F.M.; Project management, F.M., F.P.C.; Resources, F.M., F.P.C.; Software, F.M., F.P.C.; Supervision, F.M., F.P.C., S.S.A.; Validation, F.M., F.P.C., S.S.A.; Visualization, F.M., F.P.C.; Writing – original draft, F.M., J.C., S.S.A.; Writing – revision and editing, F.M., F.P.C., J.C., S.S.A.

VIII. BIBLIOGRAPHIC REFERENCES

Antolín, G., Barreda, R., Cordera, R., Alonso, B., dell'Olio, L., Moura, J. L., & Ibeas, Á. (2015). Metodología de diseño de encuestas origen-destino incorporando análisis del estacionamiento. *Estudios de Transporte*, 19(1), 5–20. <https://www.estudiosdetransporte.org/sochitran/article/view/140>

Arévalo-Molina, Y., Pérez-Bustamante, L., & Villouta-Gutiérrez, D. (2023). Prácticas de movilidad cotidiana y estructura urbana en el entorno periurbano: Lomas Coloradas y Portal de San Pedro, San Pedro de la Paz (Chile). *Urbano*, 26(47), 34–45. <https://doi.org/10.22320/07183607.2023.26.47.03>

Arvidsson, M., Lovsjö, N., & Keuschnigg, M. (2023). Urban scaling laws arise from within-city inequalities. *Nature Human Behaviour* 7, 365–374. <https://doi.org/10.1038/s41562-022-01509-1>

Basulto Gallegos, Ó. F., Castro Cáceres, R. A., & Jara Jara, B. S. (2023). Representaciones sociales, jurídico-normativas sobre educación: inclusión, calidad y equidad del sistema educativo chileno. *Revista Reflexión e Investigación Educativa*, 4(2), 57–72. <https://doi.org/10.22320/reined.v4i2.5782>

Bécue-Bertaut, M., & Pagès, J. (2008). Multiple factor analysis and clustering of a mixture of quantitative, categorical and frequency data. *Computational Statistics & Data Analysis*, 52(6), 3258–3268. <https://doi.org/10.1016/j.csda.2007.09.023>

Bejaei, M., Cliff, M. A., & Singh, A. (2020). Multiple Correspondence and Hierarchical Cluster Analyses for the Profiling of Fresh Apple Customers Using Data from Two Marketplaces. *Foods*, 9(7), 873. <https://doi.org/10.3390/foods9070873>

Bellet Sanfeliu, C., & Llop Torné, J. M. (2004). Ciudades intermedias: entre territorios concretos y espacios globales. *Ciudad y Territorio. Estudios Territoriales*, 36(141-142), 569–581. <https://recyt.fecyt.es/index.php/CyTET/article/view/75486>

Bettencourt, L. M. A., Lobo, J., Helbing, D., Kühnert, C., & West, G. B. (2007). Growth, innovation, scaling, and the pace of life in cities. *Proc. Natl Acad. Sci.* 104(17), 7301–6. <https://doi.org/10.1073/pnas.0610172104>

Beuf, A. (2020). Centralidad y policentralidad urbanas: Interpretaciones, teorías, experiencias. *Espiral, Revista de Geografías y Ciencias Sociales*, 1(2), 131–155. <https://doi.org/10.15381/espiral.v1i2.17135>

Bustamante, D., Cortés, A., & Maturana, F. (2023). Movilidad cotidiana en pandemia: oportunidades y obstáculos urbanos ante un sistema de transporte inconcluso. El caso de la comuna de Renca, Santiago de Chile. *Cuadernos de Geografía: Revista Colombiana de Geografía*, 32(2), 345–365. <https://doi.org/10.15446/rcdg.v32n2.103846>

Centro de Estudios TECHO-Chile. (14 de octubre de 2024). *Reporte de Avances del Plan de Emergencia Habitacional en Campamentos 2022-2025 (Informe Técnico N°1)*. <https://cl.techo.org/reportes-de-avances-del-plan-de-emergencia-habitacional-en-campamentos-2022-2025/>

Chávez Galindo, A. M., Rodríguez Vignoli, J., Acuña, M., Barquero, J., Macadar, D., Pinto da Cunha, J. M., & Sobrino, J. (2008). Migración interna y cambios metropolitanos: ¿qué está pasando en las grandes ciudades de América Latina? *Revista Latinoamericana de Población*, 10(18), 7–41. <https://doi.org/10.31406/relap2016.v10.i1.n18.1>

Comisión Económica para América Latina y el Caribe [CEPAL]. (7 de septiembre de 2022). *Los servicios básicos de agua potable y electricidad como sectores clave para la recuperación transformadora en América Latina y el Caribe*. <https://www.cepal.org/es/enfoques/servicios-basicos-agua-potable-electricidad-como-sectores-clave-la-recuperacion>

De Mattos, C. A. (2010). Una nueva geografía latinoamericana en el tránsito de la planificación a la gobernanza, del desarrollo al crecimiento. *Scripta Nova. Revista Electrónica de Geografía y Ciencias Sociales*, 14(331), 102. <https://revistes.ub.edu/index.php/ScriptaNova/article/view/1751>

Dehne, P., Hoffmann, J., Roth, H., & Mainet, H. (2023). Stratégies et urbanisme dans les villes petites et moyennes en Allemagne et en France en E. Gustedt, U. Grabski-Kieron, C. Demazière, & D. Paris (Eds.), *Villes et métropoles en France et en Allemagne* (pp. 106–133). Verlag der ARL – Akademie für Raumentwicklung in der Leibniz-Gemeinschaft.

Geurs, K. T. & Van Wee, B. (2004). Accessibility evaluation of land-use and transport strategies: Review and research directions. *Journal of Transport Geography*, 12(2), 127–140. <https://doi.org/10.1016/j.jtrangeo.2003.10.005>

González, R. (2017). Segregación educativa en el sistema chileno desde una perspectiva comparada. En Ministerio de Educación de Chile (Ed.), *El primer gran debate de la reforma educacional: Ley de Inclusión Escolar* (pp.48-107). Ministerio de Educación - Gobierno de Chile.

Guérouis, M., Pavard, A., Bretagnolle, A., & Mathian, H. (2016). Les temps de transport pour délimiter des aires urbaines fonctionnelles? Une investigation critique à partir de trois métropoles européennes. *Belgeo*, 2). <https://doi.org/10.4000/belgeo.17789>

Guo, Q., & Ma, X. (2023). How Does the Digital Economy Affect Sustainable Urban Development? Empirical Evidence from Chinese Cities. *Sustainability*, 15(5), 4098. <https://doi.org/10.3390/su15054098>

Hadachi, A., Pourmoradnasseri, M., y Khoshkhal, K. (2020). Unveiling large-scale commuting patterns based on mobile phone cellular network data. *Journal of Transport Geography* 89. 102871. <https://doi.org/10.1016/j.jtrangeo.2020.102871>

Harris, C. D. (1954). The market as a factor in the localization of industry in the United States. *Annals of the Association of American Geographers*, 44(4), 315–348. <https://doi.org/10.1080/00045605409352140>

He, C., Li, D., Ma, Q., & Yi, D. (2022). City Bias: Affordable Housing Accessibility Assessment—Evidence from 153 Prefectural Cities in China. *SAGE Open*, 12(4), 1–19. <https://doi.org/10.1177/21582440221144634>

Hernández-Sampieri, R., & Mendoza, C. (2018). *Metodología de la Investigación. Las rutas cuantitativa, cualitativa y mixta*. Editorial Mc Graw Hill Education.

Hernández, D., & Rossel, C. (2015). Inequality and access to social services in Latin America: space-time constraints of child health checkups and prenatal care in Montevideo. *Journal of Transport Geography*, 44, 24–32. <https://doi.org/10.1016/j.jtrangeo.2015.02.007>

Hidalgo Dattwyler, R., Paulsen Espinoza, A., Alvarado Peterson, V., Vergara Constela, C., & González Rodríguez, M. (2021). La vivienda social en los municipios costeros del norte de Chile: sostenibilidad subsidiaria

e integración en el desarrollo urbano regional (2000-2018). Cuadernos de Geografía: Revista Colombiana de Geografía, 30(2), 336–358. <https://doi.org/10.15446/rcdg.v30n2.88730>

Husson, F., Josse, J., Lê, S., & Mazet, J. (2023). FactoMineR: Multivariate Exploratory Data Analysis and Data Mining (Versión 2.8) [Paquete de R]. CRAN. <https://cran.r-project.org/web/packages/FactoMineR/index.html>

Husson, F., Lê, S., & Pagès, J. (2017). *Exploratory multivariate analysis by example using R* (2a ed.). Chapman & Hall/CRC. <https://doi.org/10.1201/b21874>

Instituto Nacional de Estadísticas de Chile [INE] (19 de abril de 2017). *XIX Censo Nacional de Población y VIII de Vivienda [Base censal]*. https://redatam-ine.cl/redbin/RpWebEngine.exe/Portal?BASE=CENSO_2017&lang=esp

Instituto Nacional de Estadísticas de Chile [INE]. (2018). *Metodología*. VIII Encuesta de Presupuestos Familiares (EPF). Gobierno de Chile. https://www.ine.gob.cl/docs/default-source/encuesta-de-presupuestos-familiares/metodologia/viii-epf---julio-2017---junio-2017/metodolog%C3%ADa-viii-epf.pdf?sfvrsn=f098409c_2

Instituto Nacional de Estadísticas de Chile [INE]. (2024). *Resultados*. Gobierno de Chile. <https://censo2024.ine.gob.cl/resultados/>

Icazuriaga Montes, C. & Osorio Franco, L. E. (2014). La relación periferia-centro en la ciudad de Querétaro mediante las prácticas de movilidad y consumo. *Alteridades*, 17(33), 21-41. <https://www.scielo.org.mx/pdf/alte/v17n33/v17n33a3.pdf>

Jirón, P., & Mansilla, P. (2013). Atravesando la espesura de la ciudad: vida cotidiana y barreras de accesibilidad de los habitantes de la periferia urbana de Santiago de Chile. *Revista de Geografía Norte Grande*, (56), 53-74. <https://doi.org/10.4067/S0718-34022013000300004>

Kara, B. (2019). The Impact of Globalization on Cities. *Journal of Contemporary Urban Affairs*, 3(2), 108–113. <https://doi.org/10.25034/ijcua.2018.4707>

Lamfre, L., Perren, J., & Bramardi, S. (2023). Análisis de Correspondencias Múltiple Condicionada. Una aplicación al estudio de la calidad de vida según clase social en la Argentina de inicios del milenio. *SaberEs*, 15(2), 157–175. <https://saberes.unr.edu.ar/index.php/revista/article/view/272>

Lazo, A., Martínez, M., Maturana, F., Solsona, D. & Ther, F. (2023). Movilidad urbana e interurbana en la Isla Grande de Chiloé: Patrones de viaje en ciudades intermedias y de menor tamaño en un contexto archipelágico. *Revista EURE*, 50(150), 1-24. <https://doi.org/10.7764/EURE.50.150.07>

Liu, S., Liao, Q., Liang, Y., Li, Z., & Huang, C. (2021). Spatio-temporal heterogeneity of urban expansion and population growth in China. *International Journal of Environmental Research and Public Health*, 18(24), 13031. <https://doi.org/10.3390/ijerph182413031>

Lobo, C., & Cunha, J. (2019). Migration and commuting in the areas of influence of the Brazilian metropolises. *Mercator*, 18. <https://doi.org/10.4215/rm2019.e18017>

Louail, T., Lenormand, M., Cantu Ros, O. G., Picornell, M., Herranz, R., Frías-Martínez, E., Ramasco, J. J., & Barthelemy, M. (2014). From mobile phone data to the spatial structure of cities. *Scientific Reports*, 4(1), 5276. <https://doi.org/10.1038/srep05276>

Marinho, M. L., Dahuabe, A., & Arenas de Mesa, A. (2023). *Salud y desigualdad en América Latina y el Caribe: la centralidad de la salud para el desarrollo social inclusivo y sostenible*. Serie Políticas Sociales, N° 244. Comisión Económica para América Latina y el Caribe [CEPAL]. <https://repositorio.cepal.org/server/api/core/bitstreams/b816a7eb-10d7-4f37-8eba-e6cb8feb91cc/content>

Mary-Portas, F.-L., & Bertrand, P. (2017). Des villes moyennes marquées par leur diversité fonctionnelle et leur insertion dans un réseau métropolitain. *Insee Analyses Auvergne-Rhône-Alpes*, (39), 1-4. <https://www.insee.fr/fr/>

statistiques/2840610

Maturana Miranda, F. & Vial Cossani, C. (2011). El policentrismo ¿una utopía para el caso chileno? elementos desde un análisis teórico conceptual. *Revista Tiempo y Espacio*, (27), 49-70. <https://revistas.ubiobio.cl/index.php/TYE/article/view/1786>

Maturana Miranda, F. & Arenas Vásquez, F. (2012). El policentrismo en Chile: medición exploratoria para el sistema de ciudades de las regiones de La Araucanía, de Los Ríos y de Los Lagos. *Revista de Geografía Norte Grande*, (52), 37-56. <http://dx.doi.org/10.4067/S0718-34022012000200003>

Maturana, F., Sposito, M. E., Bellet, C., Henríquez, C., & Arenas, F. (Eds.). (2017). *Sistemas urbanos y ciudades medias en Iberoamérica*. Ediciones Serie GeoLibros. <https://geografia.uc.cl/investigacion/serie-geolibros/sistemas-urbanos-y-ciudades-medias-en-iberoamerica/>

Maturana Miranda, F., & Montoya, J. W. (2021). *Sistemas urbanos en América Latina, el Caribe y Estados Unidos: un balance en los albores del siglo XXI*. Editorial Universidad Nacional de Colombia.

Maturana Miranda, F., Peña-Cortés, F. & Ortiz Novoa, J. A. (2024). Trayectoria demográfica y coevolución del empleo en los Andes del Sur. El caso de las ciudades de la macrozona sur de Chile y su transformación simplificada de las actividades de servicios. *Cuadernos de Geografía: Revista Colombiana de Geografía*, 33(2), 485-505. <https://doi.org/10.15446/rcdg.v33n2.109801>

Ministerio de Desarrollo Social y Familia. de Chile. (2025). *Estrategia de Chile para la implementación de la Agenda 2030. Reporte de Avance 2023-2025*. https://www.chileagenda2030.gob.cl/wp-content/uploads/2026/03/Reporte_Avance_Estrategia_Implementacion_Agenda_2030-FINAL-WEB-2.pdf

Ministerio de Salud de Chile. (2022). *Estrategia Nacional de Salud para los Objetivos Sanitarios al 2030*. <https://www.minsal.cl/wp-content/uploads/2022/03/Estrategia-Nacional-de-Salud-2022-MINSAL-V8.pdf>

Ministerio de Vivienda y Urbanismo. (2014). *Hacia una nueva política urbana para Chile. Política Nacional de Desarrollo Urbano. Ciudades Sustentables y Calidad de Vida*. https://cndt.cl/wp-content/uploads/2024/03/Politica_Nacional_de_Development-Urbano-1.pdf

Mseke, E. P., Jessup, B., & Barnett, T. (2024). Impact of distance and/or travel time on healthcare service access in rural and remote areas: A scoping review. *Journal of Transport & Health*, 37, 1-15. <https://doi.org/10.1016/j.jth.2024.101819>

Muda, N., & Ahmad Raphaie, F.K. (2025). A multiple correspondence analysis towards understanding of public and self-stigma in mental health help-seeking among Malaysian university students. *Scientific Reports* 15, 31572. <https://doi.org/10.1038/s41598-025-15834-8>

Naciones Unidas Perú. (2021). *Marco de Cooperación de las Naciones Unidas para el Desarrollo Sostenible, Perú 2022-2026. Hoja Informativa*. https://peru.un.org/sites/default/files/2021-09/Marco%20de%20cooperacion%20ONU%20Peru%20Hoja%20Informativa_FINAL_1.pdf

Ossa Cornejo, C., Jiménez Figueroa, A., Gómez Urrutia, V., & Hidalgo Ortiz, J. (2024). Estructura Factorial e Invarianza del Cuestionario Condiciones para Teletrabajo en el Hogar en Población Chilena. *Psykhé*, 33(2). <https://dx.doi.org/10.7764/psykhe.2022.48215>

Otzen, T., & Manterola, C. (2017). Técnicas de Muestreo sobre una Población a Estudio. *International Journal of Morphology*, 35(1), 227–232. <https://doi.org/10.4067/S0717-95022017000100037>

Peña-Cortés, F., Schuster, J. P., Arévalo-Valenzuela, P., Arenas, F., & Fuentes, L. (2022). Ordenamiento Territorial en la costa de Chile: Alcances, competencias y estado de situación en Martínez, C., Cienfuegos, R., Barragán, J. M., Navarrete, S., Hidalgo, R., Arenas, F. y Fuentes, L. (Eds.) *Hacia una Ley de Costas en Chile: bases para una gestión integrada de Áreas Costeras*, (pp. 435-455). Pontificia Universidad Católica de Chile. Serie GEOLibros.

Pumain, D., Bretagnolle, A., & Degorge-Lavagne, M. (1999). La ville et la croissance urbaine dans l'espace-temps. *Mappemonde*, (3), 38–42. https://www.persee.fr/doc/mappe_0764-3470_1999_num_55_3_1522

Pumain, D., Paulus, F., Vacchiani-Marcuzzo, C., & Lobo, J. (2006). An evolutionary theory for interpreting urban scaling laws. *Cybergeo: European Journal of Geography*, 343. <https://doi.org/10.4000/cybergeo.2519>

Pumain, D. & Saint-Julien, T. (2014). *Análisis espacial. Las interacciones*. Pontificia Universidad Católica de Chile. Serie GEOlibros.

Ríos Calderón, C. A. (2022). Diseño de muestreo para estimar la cantidad de lotes defectuosos causados por desajuste en equipos semiautomáticos de acabado industrial en distintas líneas de producción en un proceso de troquelado metálico. *Revista Científica del Sistema de Estudios de Postgrado de la Universidad de San Carlos de Guatemala*, 5(2), 77–86. <https://doi.org/10.36958/sep.v5i2.100>

Riquelme Brevis, H., Saravia Cortés, F. & Azócar Weisser, J. (2019). Movilidad cotidiana e interurbana en contextos de exclusión socioespacial al sur de Chile. Aportes para pensar los territorios no metropolitanos en América Latina. CUHSO: *Cultura-hombre-sociedad*, 29(2), 80–108. <https://doi.org/10.7770/cuhs0-v29n2-art1903>

Riquelme Brevis, H., Canales Urriola, J., Azócar Weisser, J. & Riquelme Brevis, M. (2020). Viajeros interurbanos en un contexto patrimonial ferroviario: evaluación cuantitativa del servicio Regional Victoria - Temuco, Chile. *Revista de urbanismo*, (43), 63–78. <https://doi.org/10.5354/0717-5051.2020.57095>

Rojas, C., Vecchio, G. & Ladrón de Guevara, F. (2024). *Accesibilidad para ciudades equitativas*. RIL editores- <https://estudiosurbanos.uc.cl/libro/accesibilidad-para-ciudades-equitativas/>

Samaniego, H., Franco-Cisterna, M., & Sotomayor-Gómez, B. (2020). The Topology of Communicating Across Cities of Increasing Sizes, or the Complex Task of “Reaching Out” in Larger Cities in Pumain, D. (Eds.), *Theories and Models of Urbanization. Lecture Notes in Morphogenesis*. Springer Nature. https://doi.org/10.1007/978-3-030-36656-8_6

Santamaria, F. (2012). Les villes moyennes françaises et leur rôle en matière d'aménagement du territoire: Vers de nouvelles perspectives? *Norois*, 223(2), 13–30. <https://doi.org/10.4000/norois.4180>

Sheller, M., & Urry, J. (2016). Mobilizing the new mobilities paradigm. *Applied Mobilities*, 1(1), 10–25. <https://doi.org/10.1080/23800127.2016.1151216>

Soza-Amigo, S., Parada, J. & Colther, C. (2023). Conmutación en Chile durante el periodo 2010-2019. *Revista de Geografía Norte Grande*, 85, 1– 24. <http://dx.doi.org/10.4067/s0718-34022023000200112>

Sperry, B. R., Larson, S., Leucinger, D., Janowiak, S., & Morgan, C. A. (2012). Design and implementation of internet-based traveler intercept survey. *Transportation Research Record: Journal of the Transportation Research Board*, 2285(1), 84–90. <https://doi.org/10.3141/2285-10>

Tiznado-Aitken, I., Vecchio, G., Guzman, L. A., Arellana, J., Humberto, M., Vasconcellos, E., & Muñoz, J. C. (2023). Unequal periurban mobility: Travel patterns, modal choices and urban core dependence in Latin America. *Habitat International*, 133, 102752. <https://doi.org/10.1016/j.habitatint.2023.102752>

Ubilla-Bravo, G. F., & Chia, E. (2021). Construcción del periurbano mediante instrumentos de regulación urbana: caso de ciudades intermedias en la Región Metropolitana de Santiago-Chile. *Cuadernos Geográficos*, 60(2), 275–296. <https://doi.org/10.30827/cuadgeo.v60i2.8701>

Ubilla-Bravo, G., & Mardones Cáceres, M. (2024). Ecological planning as the basis of spatial planning in the periurban area of Curicó city. *Revista Geográfica De Chile Terra Australis*, 60(2). <https://doi.org/10.23854/07199562.2024602.mardones>

Zhao, H., Zhao, P., Liu, Q., Zhang, M., & Jiang, S. (2024). Unraveling urban dynamics: Scaling laws of human mobility across the cityscape divide. *Fundamental Research*. 5(6), 2731–2740. <https://doi.org/10.1016/j.fmre.2024.10.008>

Zhuo, L., Chen, Z., Wu, C., Shi, Q., Gu, Z., Tao H., & Li, Q. (2022). Deriving intercity human flow pattern and mechanism based on cell phone location data: case study of Guangdong Province, China. *Computational Urban Science*, 2(4). <https://doi.org/10.1007/s43762-022-00033-2>

Zurbano, M., Bidaurratzaga, E., & Martínez, E. (2014). Las transformaciones de los modelos territoriales de desarrollo en el contexto de la globalización. Aportaciones desde la perspectiva del desarrollo humano local. *Revista de Estudios Regionales*, (99), 103–133. <https://www.redalyc.org/pdf/755/75531857004.pdf>

IX. ACKNOWLEDGMENTS

This research was sponsored by the ANID (National Research and Development Agency) and FONDECYT (National Fund for Scientific and Technological Development) Regular projects, Folios 1230159 and 1221931.

X. APPENDIX

Questions of the applied questionnaire

1. What age range are you in?

- 18-25
- 26-35
- 36-50
- 51-65
- 65+

2. What is your level of education?

- Primary or Incomplete Secondary
- Complete Secondary
- Incomplete technical or university studies
- Technical
- University

3. What do you currently do for a living?

- Work
- Study
- Looking for a job
- Homeowner
- Retired
- Others

4. How many times a week do you travel to Temuco/Valdivia?

- Once a week
- Between 2 and 3 times a week
- More than 4 times a week
- Once a month or very occasionally

5. What is the reason for your trip?

- Work
- Study
- Errands
- Health
- General purchases
- All

6. How long does it (usually) take to get to your final destination?

- < 30 minutes
- Between 30 minutes and an hour
- Between an hour and an hour and a half
- An hour and a half and 2 hours
- More than 2 hours

7. How do you travel to Temuco/Valdivia (at least once by personal vehicle, then mark 2)

- Only by shared transport (buses)
- By shared transportation and personal vehicle
- Personal vehicle

8. As for your trips by shared transport (buses)

- The frequency is optimal for both the outbound journey and the return
- Only the outbound
- Only the return
- The frequency is not optimal in any case

9. Approximately how much (%) of your total expenses excluding housing do you spend in Temuco?

- < 25%
- Between 25% and 50%
- 50% to 75%
- 75%

10. According to the reality of your city, what services must you usually go to Temuco/Valdivia to access? (There can be several options)

- Health (establishment, pharmacies, dentistry, medical consultations, examinations)
- Recreation in general (trips out to eat, etc.)
- Food shopping in general
- Purchase of clothing, appliances, materials, and others
- Errands associated with the State, local authorities, Fonasa (public health), civil registry, etc.
- Banking or financial errands
- Education
- Errands/purchases associated with logistics transport, telephones, mail, and connectivity in general

THE HERITAGE SCENE: TOWARD AN INTEGRATED MANAGEMENT OF URBAN VOIDS IN HISTORIC CENTERS ¹

LA ESCENA PATRIMONIAL: HACIA UNA GESTIÓN INTEGRADA DEL VACÍO URBANO EN
CENTROS HISTÓRICOS

ALMA ANDREA PONCE-SÁNCHEZ ²

¹ Doctora en Urbanismo
Académica, Departamento de Arquitectura, Facultad de Ingeniería
Universidad de La Serena, La Serena, Chile
<https://orcid.org/0009-0003-3475-6439>
aponce@userena.cl

Este artículo presenta una crítica al paradigma tradicional de preservación patrimonial, centrado en el objeto estático y material, y propone, en su lugar, el concepto de “Patrimonio Escénico” como categoría analítica integradora. La investigación, aplicada en la Zona Típica de La Serena, Chile, sostiene que el vacío urbano no es un espacio residual, sino un dispositivo espacial activo donde convergen el espacio (lo material), el acto (lo inmaterial) y el tiempo (la memoria); es en esta interacción donde emerge el verdadero valor patrimonial. A través de una metodología mixta que combina el análisis espacial evolutivo con técnicas cualitativas como la etnografía arquitectónica y el fotomontaje escénico, se evidencia una brecha estructural entre la experiencia urbana viva y los marcos regulatorios actuales que separan lo material de lo inmaterial. Los hallazgos revelan que la comunidad local valora más los usos sociales y las escenas cotidianas que la monumentalidad aislada de los edificios, lo que valida el “acto” como componente primario del patrimonio vivo. Finalmente, se propone un modelo basado en una “ficha de evaluación escénica”, que aboga por una planificación urbana holística y participativa que fortalezca la identidad y la sostenibilidad cultural de los centros históricos.

Palabras clave: patrimonio escénico, vacío urbano, metodología mixta, etnografía arquitectónica, centro histórico, gestión patrimonial, patrimonio inmaterial

This article presents a critique of the traditional heritage preservation paradigm, which focuses on the static, material object, and instead proposes the concept of “Scenic Heritage” as an integrative analytical category. The research, applied to the Typical Zone (Zona Típica) of La Serena, Chile, argues that urban voids are not residual spaces but active spatial devices where the space (the material), act (the immaterial), and time (memory) converge; it is precisely within this interaction that true heritage value emerges. Through a mixed-methods approach that combines evolutionary spatial analysis with qualitative techniques such as architectural ethnography and scenic photomontage, a structural gap is revealed between the lived urban experience and current regulatory frameworks that separate the material from the immaterial. The findings show that the local community values social uses and daily scenes more than the isolated monumentality of buildings, validating the “act” as a primary component of living heritage. Finally, a model based on a “scenic evaluation form” is proposed, advocating for holistic and participatory urban planning to strengthen the identity and cultural sustainability of historic centers.

Keywords: scenic heritage, urban void, mixed-methods approach, architectural ethnography, historic centers, urban planning, intangible heritage

I. INTRODUCTION

This research addresses the structural gap between the lived urban experience and the regulatory frameworks governing heritage conservation in Chile. Despite the conceptual evolution of heritage towards broader approaches that recognize cultural, social, and territorial values, regulatory instruments continue to operate predominantly from a material and fragmentary logic. This tension creates a disconnect between protecting the physical support of the historical city and the social practices that give it meaning, resulting in management that protects built objects but fails to integrate the lived dimension of urban space fully.

In the disciplinary field, the understanding of urban heritage has shifted in recent decades towards perspectives that recognize the cultural dimensions of the landscape, collective memory, and everyday experience as essential components of heritage value. However, there are still methodological and operational difficulties in translating these theoretical advances into management instruments capable of integrating the material and the immaterial. This fragmentation between object and practice, between built fabric and urban life, continues to manifest itself in regulations that delimit the physical without systematically incorporating the social dynamics that shape the meaning of historical spaces.

In this context, the study is set in the Typical Area (*Zona Típica*) of La Serena, Chile, as a case study, because it is a consolidated historical center where high levels of material protection and intense daily urban life coexist. This territory constitutes a relevant scenario for examining the limitations of current regulatory frameworks and, at the same time, exploring conceptual alternatives that help overcome the dichotomy between physical conservation and social experience.

The research proposes redefining the value of the urban void as a central category for an integrated heritage management. In contrast to the traditional prioritization of the built environment, it is proposed that squares, atriums, and streets should not be understood as residual interstices between constructions, but as active spatial devices where material support, social practices, and urban memory converge. From this perspective, the urban void is configured as a dynamic container of meaning, capable of articulating spatial, temporal, and performative dimensions that sustain the local identity.

The study's general aim is to formulate a conceptual and methodological framework that integrates the morphological dimension of open space with the lived and symbolic dimensions of the urban experience in historical centers. It is hypothesized that recognizing the urban void as an

active scenario enables overcoming the fragmentation between object and practice by providing an operational basis for more holistic heritage management. The novelty of the study lies in systematizing the so-called Void Paradigm as a basis for validating the Scenic Heritage as a comprehensive analytical category that combines space, act, and time within a single interpretative structure.

This study provides an operationalization of the concept of Scenic Heritage through a triaxial model and a replicable qualitative-cartographic methodology, applied to historical centers, that translates the space-act-time relationship into urban management criteria.

Methodologically, the work combines morphological-functional analysis of open space with qualitative tools for observing and recording urban dynamics, enabling the identification of void typologies, the characterization of their spatial performance, and the analysis of their ability to structure routes and absorb activities. The manuscript is organized into four sections: firstly, the conceptual framework that supports the redefinition of the urban void is developed; secondly, the methodological strategy applied to the case study is outlined; subsequently, the results of the morphological and functional analysis are presented; and finally, the implications for an integrated heritage management in historical centers are discussed.

II. THEORETICAL FRAMEWORK

THE SCENE AS A SYNTHESIS: EPISTEMIC DIMENSION

The conceptual framework of this research proposes understanding the city not as a neutral or merely physical support, but as an active cultural construct in which space, memory, and social practice are intertwined. According to the social production of space theory (Lefebvre, 2013), the urban is understood as both the result and the condition of social relations that unfold through the interaction among perceived, conceived, and lived space. This lived dimension is manifested in bodily practices and sensitive experiences that configure the public space as a permanent field of negotiation (Madanipour et al., 2013; Concha Méndez & Avilés Arias, 2023). In this line, walking can be understood as an aesthetic and meaning-producing practice (Careri, 2021), inasmuch as the route not only connects physical points but also builds narratives, activates memories, and reveals the performative dimension of the urban void. This approach is reinforced by considering that displacement is carried out "with" urban materiality, where surfaces, textures, and objects participate in the experience of living (Martínez Rodríguez, 2023), and where everyday mobility can

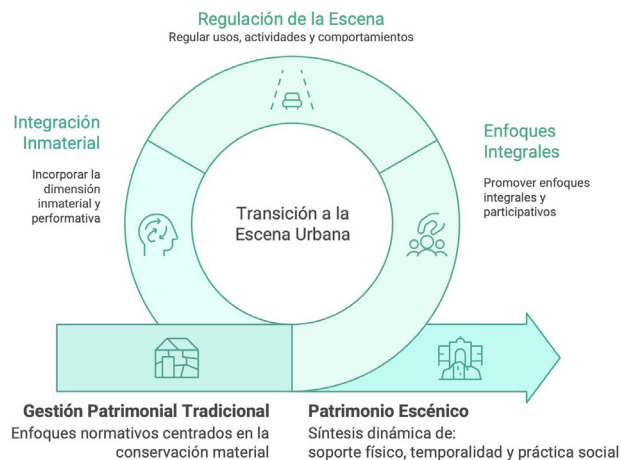


Figure 1. Integration of the Immaterial Dimension into Heritage Management. Source: Prepared by the authors, based on Gutiérrez (2010), Bandarin and Van Oers (2014), and Ortega (2021).

produce bonds of recognition and empathy in “traveling together” (Muñoz Zech, 2023).

The notion of territory as a palimpsest (Corboz, 2004) allows for interpreting the historical city as a superposition of temporal layers that acquire meaning through current use. This accumulation cannot be reduced to a formal reading, as the landscape has been redefined as a dynamic cultural construction that emerges from the symbolic relationship between society and territory (Berque, 2022). In the case of the Typical Area of La Serena, this condition becomes more complex when considering the configuration process of the so-called Serena Plan, whose identity construction has been analyzed under the category of thematic city (Torrent, 2021). According to Torrent, the thematic city is not only a coherent stylistic ensemble but a cultural project that organizes urban form, historical narrative, and collective imagery under a unifying intention. In continuity with readings on Ibero-American historical centers, this tension among projects, policies, and appropriations is inscribed in ongoing debates over management and regulatory improvisations in heritage cities (Gutiérrez, 2010). However, the thematic reading risks privileging formal coherence and the architectural narrative over the daily experience that updates these spaces. At this point, the Scenic Heritage category allows for the expansion of the notion of the thematic city, which incorporates the performative dimension of the urban void. La Serena’s squares, atriums, and streets not only express a compositional will but also serve as scenarios where traditional trade, religious celebrations, and daily meetings activate historical memory.

In line with approaches that integrate material and immaterial dimensions in heritage management (Bandarin & Van Oers, 2014; Ortega, 2021), the following conceptual outline is proposed to summarize this transition from regulatory approaches focused on the object towards an integrated understanding of the urban scene (Figure 1).

Urban vitality, understood as the density of social practices that structure public life (Gehl, 2020; Jacobs, 2011), thus becomes the mechanism that energizes the thematic form. This activation becomes especially legible when sensitive and atmospheric dimensions of urban living are considered, in which the experience of change, transition, and coexistence occurs in specific public spaces (Concha Méndez & Avilés Arias, 2023).

This understanding finds empirical support in recent studies conducted in Chilean urban heritage contexts, which demonstrate that manifestations of intangible culture are a decisive factor in the resignification of the built heritage (Paul & Valenzuela, 2024). Just as in the Quinta Normal heritage circuit in Santiago, in La Serena, the cultural value does not reside exclusively in protected architecture but in the continuity of social practices that consolidate identity and belonging. In this line, preliminary results from the traditional La Recova market show how everyday and commercial scenes serve as a support for heritage meaning beyond the material object (Ponce-Sánchez & Cifuentes-Pizarro, 2025). At the same time, these processes are related to approaches that understand the city as an iconic source of meaning, where certain spaces acquire symbolic depth through social reiteration and collective recognition (Rodríguez, 2017).

In the Latin American context, criticisms of traditional heritage management have evidenced the persistence of regulatory approaches focused on material conservation (Ortega, 2021). These tensions are in dialogue with international guidelines that promote integrated and participatory approaches to cultural sustainability (UNESCO, 2015), which emphasize the need to explicitly integrate the intangible dimension into planning instruments.

From this perspective, the transition from the urban landscape concept to the urban scene constitutes a key epistemological shift in reinterpreting the city. While the landscape privileges visuality and morphological coherence, the scene emphasizes the anthropic and relational dimension of space. In keeping with the Historical Urban Landscape approach proposed by Bandarin and Van Oers (2014), which extends the notion of conservation to the management of complex urban systems in which cultural, social, and environmental values interact, this research expands upon this perspective by situating the urban void as an active site of social practices. In this vein,



Figure 2. Construction of Scenic Heritage. Source: Preparation by the authors, based on Corboz (2004); Jacobs (2011); Concha Méndez and Avilés Arias (2023); Ponce-Sánchez and Cifuentes-Pizarro (2025).

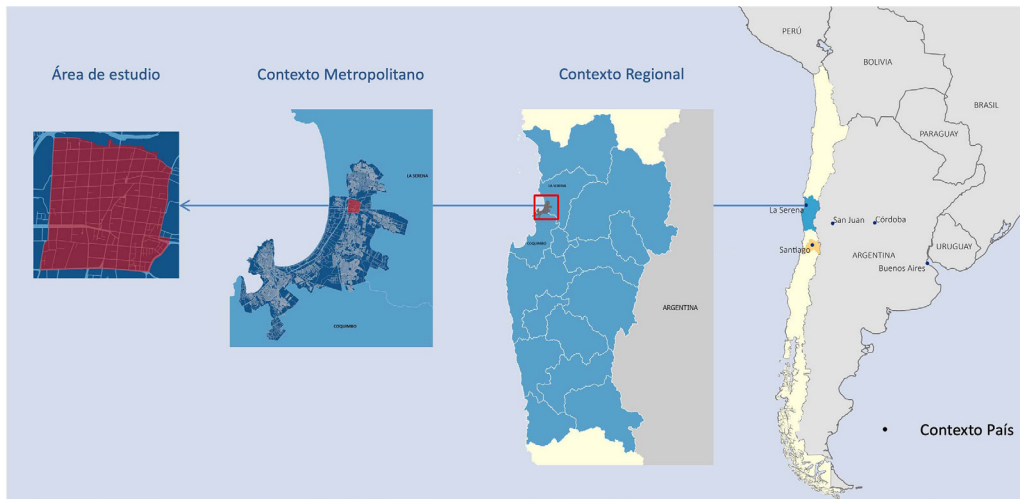


Figure 3. Geographical context of the study area. Source: Prepared by the authors.

the contributions of Fariña Tojo (2006) are fundamental in demonstrating that the urban scene is not only a perceptual condition but also a dimension susceptible to regulation, insofar as uses, activities, and behaviors configure the collective experience of public space.

From the perspective of the historical urban landscape (Bandarin & Van Oers, 2014) and the regulation of the urban scene (Fariña Tojo, 2006), the integration of physical support, historical temporality, and social practice allows the Scenic Heritage to be configured as a dynamic synthesis (Figure 2), but also as a challenge to current regulations. The morphological container, inherited from the La Serena

thematic project, acquires meaning insofar as it is activated by the daily interaction that updates it; however, such activation is not always reflected in regulatory instruments. The category of scene, therefore, allows not only for overcoming the divorce between form and urban life but also for the visibility of the need to expand regulatory frameworks to incorporate the immaterial and performative dimensions of public space. In La Serena, this articulation between formal project, social intensity, and regulation devices is particularly evident. The routes through the historic center not only connect points but also produce narratives and meanings in transit, which reinforce the subjective dimension of the lived space (Vergara Álvarez & Concha Méndez, 2023).

Similarly, public space is understood as a place of daily care and reproduction of the social, where practices that sustain urban belongings and identities are transmitted (Mora Rivera, 2023). These approaches allow situating the case of La Serena as a relevant laboratory for observing the connection among urban form, social practice, and heritage regulation.

III. CASE STUDY

Geographical Context and Identity

La Serena, capital of the Coquimbo Region (Figure 3), is part of a coastal metropolitan system located on marine terraces that produce undulating terrain that shapes its urban layout. The city's identity was forged by five religious orders that established stone temples and atriums within the foundational checkerboard.

Evolution and Protection

Between 1946 and 1952, the city underwent a radical transformation through the "Serena Plan", which unified aesthetics under a neocolonial style and prioritized empty spaces to highlight the architectural envelopes. In 1981, it was designated the second-largest Typical Zone in Chile, protecting a polygon containing 438,287 m² of public voids.

The Void as a Living Stage

The relevance of the case lies in the interdependent relationship between its open spaces, where 33 scenic containers linked to National Monuments are identified. Spaces such as the La Recova Square and the San Agustín Atrium function as active devices where the community values the "act" - everyday urban choreography - over physical monumentality, which positions the void as a key component of urban memory and vitality.

IV. METHODOLOGY

Design and Temporality of the Research.

The research was developed using a mixed approach, structured around a dual temporal dimension that allows it to approach the territory as a palimpsest. This temporality is divided into:

- Historical-Evolutionary Analysis (1713-1981): Review of 12 pieces of historical cartography to understand the evolution of the checkerboard and the consolidation of urban voids in La Serena.
- Contemporary and Ethnographic Analysis (2022-2025):

Period of primary data collection that included an intensive survey of seven consecutive days (n=7 days of systematic observation), aimed at measuring flows and acts in the selected scenic containers.

Stages of the Methodological Process

The study was carried out in four consecutive phases that allow articulating scales of analysis, from the territorial dimension to the inhabitant's experience:

- Identification and Diagnosis: Documentary review and systematic mapping of the Typical Area's 1,653,753 m² to locate heritage assets and their areas of influence.
- Characterization and Scenic Survey: Application of direct observation and architectural ethnography in 33 scenic containers, defined as units of analysis of the study.
- Structural and Socio-spatial Analysis: Using a typological classification procedure and comparative analysis of usage patterns, supported by GIS (ArcGIS Pro), the urban openings were categorized according to their dynamism (self-absorbed, extended atriums, box seats of the landscape, and expansion areas).
- Synthesis of Patterns and Validation of the Model: Integration of qualitative and quantitative results to build the Triaxial Model (Space-Act-Time), which consolidates the urban scene as an integrated management device.

Qualitative-Cartographic Triangulation

The research adopts a mixed-methods approach based on qualitative-cartographic triangulation, combining spatial analysis and lived experience. This design implies a shift in the researcher's position from "distant" (morphological-evolutionary analysis) to "immersed" (urban ethnography), enabling the capture of the complexity of the lived space.

This approach integrates quantitative and qualitative data through a combined analytical procedure to identify relationships of spatial configuration, social practices, and the temporality of use (Figure 4).

Integrating the results enabled the consolidation of the Triaxial Model (Space-Act-Time) as an interpretative and operational tool, serving as the basis for proposing a Scenic Evaluation Form focused on the dynamic management of urban heritage.

Quantitative Phase: Spatial Identification and Classification

The quantitative support focused on measuring morphological variables using GIS (ArcGIS Pro) and comparative historical cartography. The procedure included:

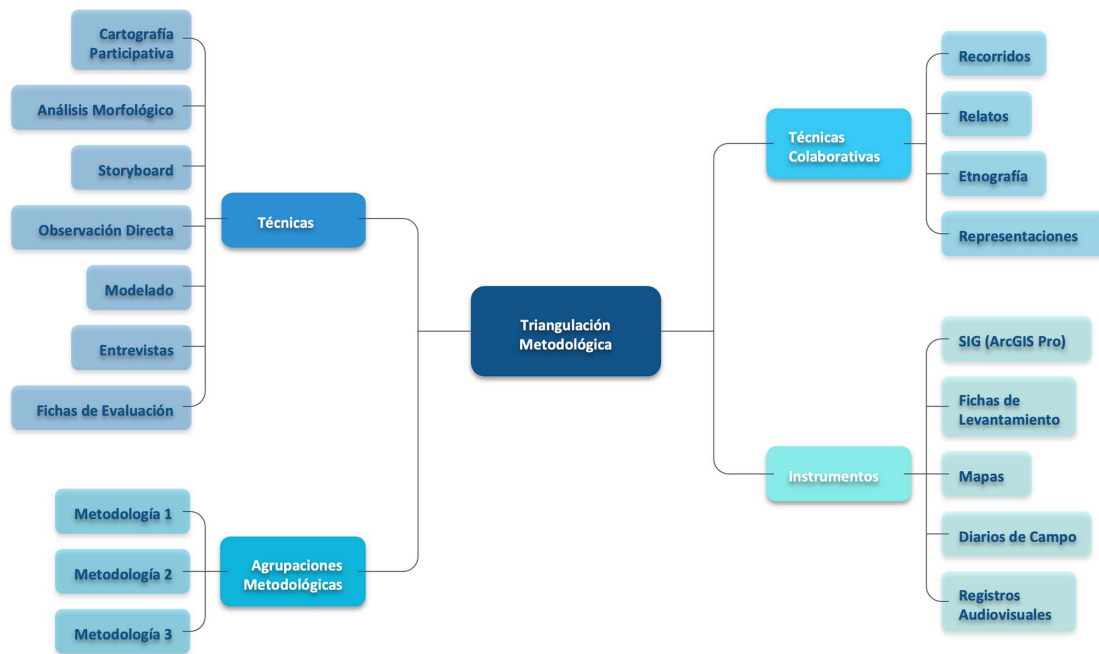


Figure 4. Qualitative-cartographic Methodological Triangulation. Source: Prepared by the authors.

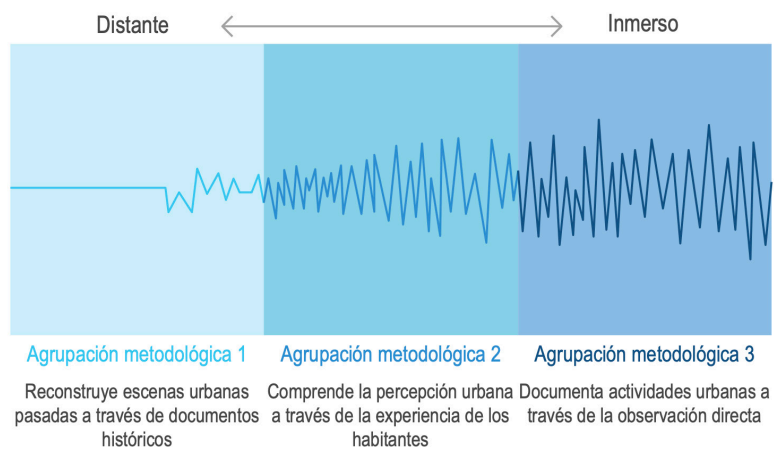


Figure 5. Initial methodological groupings. Source: Prepared by the authors.

- Identification of openings: Initially, 68 public openings were detected in the Typical Area; exclusive-vehicle openings were filtered out, resulting in 43 pedestrian spaces.
- Heritage ties: 33 scenic containers were finally selected according to the criteria of heritage relationship, pedestrian use, and activity dynamism, which maintain a direct visual or functional relationship with National Monuments (MNH) or Historical Conservation Buildings (ICH).
- Morphological typification: These spaces were classified into four categories according to their degree of closure and depth: *withdrawn, extended atriums, box seat of the landscape, and expansion areas*.
- Survey of uses: An intensive survey of seven consecutive days (n=7 days of systematic observation) was included to quantify flows, permanence activities, and diversity of acts (commercial, religious, artistic), selecting the cases with the greatest dynamism for the qualitative phase.

Qualitative Phase: Ethnographic and Collaborative Characterization

To capture the “living dimension” of heritage, the research was initially structured in three groups of three methodological (collaborative) techniques each, which addressed the Act, Space, and Time in a differentiated way (Figure 5).

However, after a validation phase in a pilot case, these were selected and grouped into four main collaborative techniques based on their relevance and ability to synthesize scenarios for analysis.

- Scenic Photomontage: A visual synthesis technique used as an analytical tool to integrate temporalities and record the overlapping of acts in the space, which allowed identifying the patterns of use, intensity of activities, and temporal overlap in the scenic containers analyzed.
- Architectural Ethnography: This is the final synthesis tool that includes spatial, temporal, and usage information. It graphically represents how inhabitants “parasitize” and re-signify historical envelopes, thereby understanding the dialectical relationship between the physical container and the lived space.
- Description of Scene and Stories: A technique that consists of the detailed recording of the activities, rhythms, and usual characters of each place. It provides a qualitative context and the atmosphere necessary to digitally reconstruct the space and populate it with the documented acts.
- Historical Photography: Its use allows adding a layer of critical temporal information to the analysis, which serves as the starting point of the urban palimpsest.

It allows comparing the evolution of the void’s use and the persistence of certain acts over the decades.

The Evaluation Model

Finally, the integration of these data allowed validating the Triaxial Model (Space-Act-Time), which serves as the basis for the proposal of a Scenic Evaluation Form. This instrument provides dynamic management that recognizes that the scene is not fixed but mutates over time, requiring periodic records to reflect the reality of living heritage.

V. CROSS-SECTIONAL FINDINGS: FROM MORPHOLOGY TO THE ACT (SYNTHESIS OF RESULTS)

The results of this research expand the heritage value of the Typical Area of La Serena, initially based on the presence of protected buildings, by incorporating a dynamic relationship between the void’s configuration and the social practices that occur within it. The cross-sectional analysis shows that urban form serves as an essential mediator, conditioning functional performance and enabling the emergence of collective acts and memories.

Activation typologies: the configuration of the void as a motor of urban life

The research identified that urban voids are not homogeneous; their morphology dictates a specific “urban choreography” through four main typologies of openings that condition the vitality of the historic center (Figure 6):

Withdrawn: Characterized by a high degree of enclosure and continuous facades, as in San Francisco Square, these create stagnant spaces for leisure, rest, and contemplation. The architectural works here are a backdrop that encourages stopping to admire and close interaction.

Extended Atrium: These act as connecting bimodal devices that run through the streets, as in the case of the Atrium of San Agustín and its facade. They act as visual finials of linear routes and as transitional spaces that organize pedestrian flow by connecting various nodes of the urban fabric.

Box seat to the Landscape: The uneven coastal terraces are used, as in the Tenri Square or the Pedro Pablo Muñoz Avenue, to link the city with its natural environment (sea, river, and hills). Their role is predominantly contemplative, offering a scale of perception that

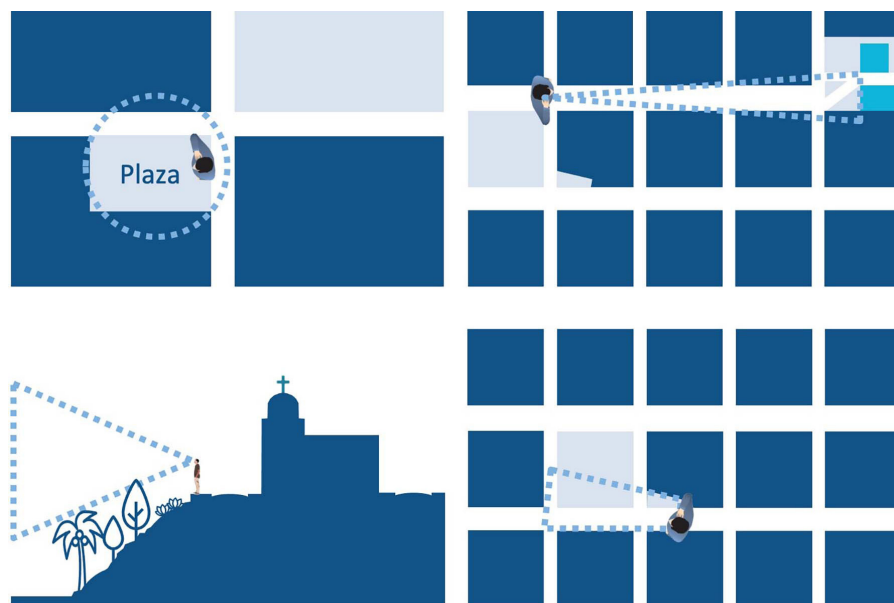


Figure 6. Types of openings. From left to right, above: Withdrawn, Extended Atrium, below: Box seat to the landscape, Expansion area. Source: Prepared by the authors.

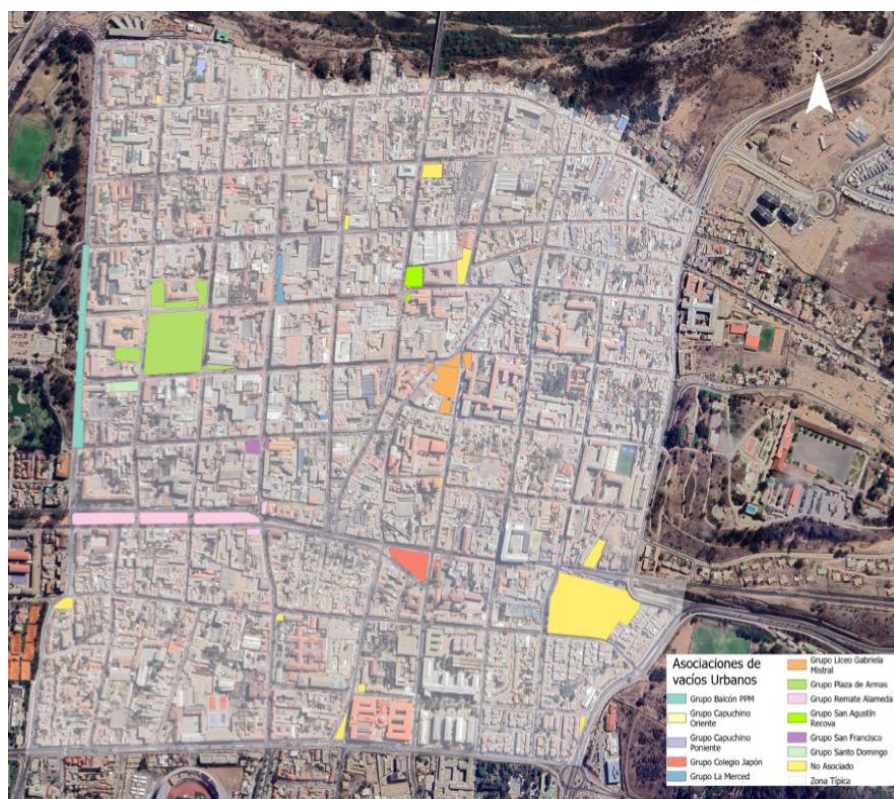


Figure 7. Associations of urban voids. Source: Prepared by the authors based on a Google Earth satellite image.

transcends the built limits and an environmental depth to the urban scene.

Expansion Area: These extensions of the road profile, such as those in Juan Pablo II Square, facilitate flexible, spontaneous appropriation. They are highly variable spaces that absorb large flows of movement, functioning as critical thresholds for commercial and social vitality.

Validation of the network of scenarios and the ignored urban hierarchy

The study of the 33 scenic containers linked to national monuments revealed a Network of Routes that supports the city's social structure. The results indicate that these openings do not operate in isolation but tend to associate with adjoining spaces, forming macro-openings.

These associations generate a real urban hierarchy based on use, which is often invisible to traditional planning instruments. While institutional regulations (CMN/SNPC) geo-reference fixed, static points, urban reality reveals spaces in transition, activated by the simultaneity of actions (Figure 7). The network of scenarios shows that the value of a heritage node increases in proportion to its ability to integrate into mobility and pause circuits, thereby creating a functional hierarchy that current regulations ignore by focusing exclusively on the protection of the "whole".

The voice of the inhabitant: The Act as a true heritage component

The final validation of the paradigm shift comes from urban ethnography, where the inhabitants' stories allow us to interpret that the sense of place resides in social interaction rather than solely in the monument's materiality.

"El Buho" (local inhabitant and observer) validates the dimension of the Act by stating: *"I like to sit here, because I found friends here"*, which anchors the value of the square for social connection and not in its protected facades.

"The Florist" brings the dimension of Time and transformation by showing how the change from a street to a pedestrian route allowed the space to become *"full of street vendors"*, which shows that memory and use constantly reconfigure the heritage meaning.

"The Waiter" and "The Painter" reinforce that the space is valued as Scenic Heritage to the extent that it serves as a social destination and as a means of acknowledging their daily tasks.

Taken together, these cross-sectional findings suggest that the scenic void is an active device whereby heritage is produced and reproduced through movement, allowing the community not only to preserve its past but also to project its identity into the future.

VI. DISCUSSION: THE GAP BETWEEN THE REGULATIONS AND LIFE

The interpretation of the empirical findings in the Typical Area of La Serena reveals a structural gap between the living urban experience and the regulatory frameworks governing heritage in Chile. While citizens' lives flow in a constant choreography of uses and affection, institutionality persists in a binary vision that separates the material from the immaterial, resulting in a management that protects the "stone", but remains blind to the "scene".

Contrast of Criteria: Institutionality vs. Scenic Dimension

The core of the conflict lies in the evaluation criteria. The current frameworks, represented by the National Monuments Council (CMN) and the National Cultural Heritage Service (SNPC), operate on the logic of tangible, static objects. In contrast, this research proposes criteria based on the space–act–time relationship, in which the urban void is interpreted as a living scene rather than a mere morphological remnant.

This divergence manifests itself in three critical lines:

- **Territoriality and Blindness to "Spaces in Transition":** Institutional regulations are based on the georeferencing of fixed points. However, the reality of La Serena reveals spaces in transition, such as the extended atriums and expansion areas, which are dynamically activated by social flow. The institution regulates the "fabric" (the built), but ignores the "skin" (public life).
- **Temporality: The Historical vs. The Cyclical:** Traditional instruments (technical datasheets and inventories) capture a historical/static approach. However, the scenic heritage validated in this thesis demonstrates that the value lies in the cyclical temporality — ritual acts, seasonal fairs, and recurring appropriations — that update the sense of place day after day.
- **Instrumentalization of the Management:** While the CMN uses descriptive sheets of the object, the scenic approach proposes tools such as perceptual mapping, storyboarding, and architectural ethnography. These allow capturing what is invisible for the current law: the "pulse of the people" and the collective memory deposited in the void.

Protected Property vs. Active Scenario: The case of St. Augustin Church versus La Recova

To illustrate what is being protected today and what should be protected under a new paradigm, it is necessary to contrast two spatial realities of La Serena:

1. **The Protected Property (San Agustín Church):**
Under the current regulations (Law 17.288, 1970),

this is a representative example of institutional success. Its limestone materiality, its stylistic unity, and its static volumetry are protected. It is a monument-object whose value is independent of whether the surrounding space is alive or deserted.

2. The Active Stage (La Recova Square and San Agustín Atrium): Despite its immense vitality, this space is managed under secondary criteria of “environmental conservation” (typical area), which, in practice, are insufficient to protect its essence. La Recova is not only a building-market; it is an active spatial device where characters such as “El Buho”, artisans, the painter, and the flow of tourists converge, and it also constitutes a spatial unit with the San Agustín church.

Under the current regulations, if the social activity in La Recova were to disappear, the building would remain as “heritage”. Under the paradigm of Scenic Heritage, the place would lose its essential value, because the act is the primary component that gives meaning to the container. Therefore, management in the future must move from protecting the isolated monument to safeguarding the dynamic macro-opening, ensuring that social uses and identity scenes have the same legal weight as the facade that frames them.

VII. PROPOSAL OF THE MODEL AND THE MANAGEMENT TOOLS

The final solution emerging from this research proposes a paradigm shift in the administration of historical centers, moving from the preservation of isolated objects to the integrated management of the urban scene. This proposal is operationalized through a robust conceptual model and technical tools designed to capture the vitality of the living heritage.

The Triaxial Model: The Basis for Comprehensive Urban Planning

The core of the proposal is the Triaxial Model of Scenic Heritage (Ponce-Sánchez & Cifuentes-Pizarro, 2025), represented in a diagram that links three interdependent dimensions that converge in the urban void (Figure 8):

- The Space (Material Axis): It is defined as the morphological container and physical-symbolic support. Its analysis is not limited to volumetry but to how the historical envelopes (facades, heights, and textures) frame and qualify the space where public life unfolds.
- The Act (Immaterial Axis): This includes the living dimension and social interaction. It includes everyday uses, rituals, social appropriations, and the “urban choreography” that activates the place.

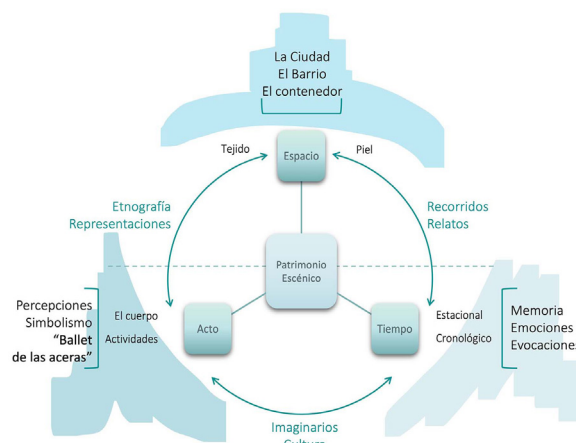


Figure 8. Triaxial Model of the Scenic Heritage. Source: Ponce-Sánchez and Cifuentes-Pizarro (2025).

It is the component that gives dynamism and “humanizes” the physical support.

- The Time (Memory Axis): This reflects the sedimentation of meanings and the cyclical repetition of scenes that reinforce the community's identity and sense of belonging.

This model is a tool with great potential to contribute to Comprehensive Urban Planning, since it allows urban voids—squares, atriums, and expansions—to be recognized not as remnants, but as essential social and cultural infrastructure. By balancing these three lines, the work can ensure that architectural conservation does not come at the expense of the sector's social vitality.

The Scenic Evaluation Form: An Operational Management Tool

To translate the theoretical model into concrete actions, a Scenic Evaluation Form is proposed as a standard for the holistic classification and assessment of urban elements (Figure 9).

Unlike the traditional inventories of the National Monuments Council (CMN), which are static and focused on the object, this form is defined by its cyclical and dynamic character:

- Cyclical Update: The research recognizes that “the scene is not fixed”; uses, rhythms, and social appropriations mutate over time. Therefore, the form functions as a living mechanism that requires periodic records to ensure that conservation policies reflect the territory's current reality.
- Integration of Criteria: The instrument simultaneously evaluates the integration between

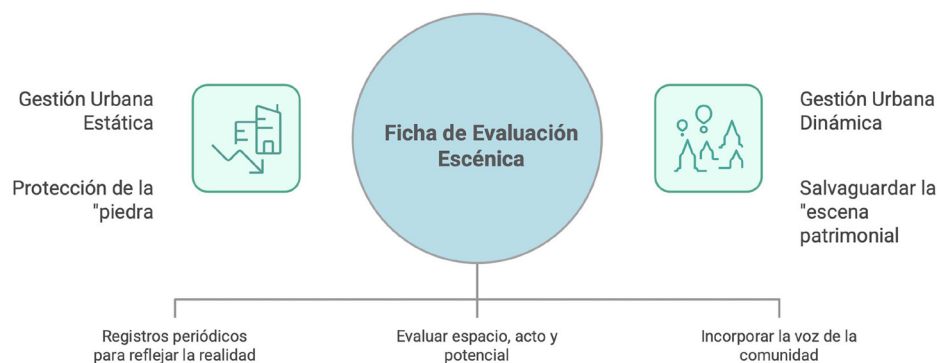


Figure 9. Scenic evaluation sheet. Operational Management Instrument. Source: Prepared by the authors.

- space and act, the evocative capacity of the place, and the general scenic potential.
- Inclusive and Participatory Management: The form incorporates the voices of the user community and the local cultural actors, validating that heritage value resides in the experience of the inhabitant and not only in the judgment of experts.

These tools allow urban management in areas such as La Serena to move beyond the protection of the “stone” and focus on safeguarding the “heritage scene”, which ensures cultural sustainability that nourishes local identity in the present and into the future.

VIII. CONCLUSIONS: CULTURAL SUSTAINABILITY AND THE FUTURE OF HERITAGE

The findings in the Typical Area of La Serena show that the heritage value lies not only in the protected architecture but also in the constant interaction of material support, social events, and memory sedimented over time. Given this, the research develops a new conceptual framework to define and validate scenic heritage as a fundamental analytical category for urban planning and heritage conservation. This paradigm allows overcoming the traditional divide between material and intangible heritage. It proposes a comprehensive vision that recognizes the urban void as an active scenario rather than a mere residual interstice. The consistency of this category is supported by empirical evidence from the triaxial Space–Act–Time model, which captures the complexity of the historical city as a living system. Empirical evidence from the 33 identified scenic containers showed that the lived space, where rites, trade, and everyday life converge, imparts meaning and value to the space defined by institutional

regulations. In short, the research shows that the scenic dimension has the potential to combine tangible and intangible values with environmental characteristics that shape place identity.

In this context, it is imperative to move from a vision of heritage focused on the static object to a dynamic, relational understanding of urban space.

The scenic heritage approach influences the disciplines of urbanism and architecture by providing tools for comprehensive, inclusive, and participatory urban planning. Recognizing that the community values uses and scenes more than the monuments themselves makes it possible for heritage management to shift from a technical imposition to a collaborative social process. This approach allows communities to project themselves into the future by strengthening their identity through cultural sustainability that avoids the fossilization of historical centers and allows living manifestations to evolve in the present; by strengthening the sense of belonging, on recognizing places with meaning and incorporating local voices in the heritage analysis, which reinforces the emotional bond between citizens and their built environment; and through dynamic management, supported by tools that propose planning sensitive to the ephemeral and capable of adapting to the transformations of social uses without losing the historical essence of the place.

Scenic heritage becomes a resource for building more resilient and inclusive cities, where protecting the past serves as a basis for nourishing the social and cultural life of future generations. From a conceptual point of view, the paradigm overcomes the static approach by integrating space, act, and time, offering a framework that recognizes the meaning residing in both the constructed materiality and the scene it inhabits. At the methodological level, a

mixed, replicable approach is proposed that uses tools such as scenic photomontage and architectural ethnography, which are effective in capturing the relationship between the ephemeral and the permanent. In the applied sphere, the research provides specific instruments, such as the scenic assessment sheet, that guide planning towards a more holistic and sensitive approach capable of simultaneously protecting the morphology and vitality of historic cities.

Ultimately, adopting this paradigm will promote cultural sustainability that not only preserves past forms but also strengthens the complex urban choreography that inhabits heritage spaces in the present.

IX. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, APS; Data curation, APS; Formal analysis, APS; Acquisition of financing, APS; Research, APS; Methodology, APS; Project management, APS; Resources, APS; Software, APS; Supervision, APS; Validation, APS; Visualization, APS; Writing – original draft, APS; Writing – revision and editing, APS.

X. BIBLIOGRAPHIC REFERENCES

Bandarin, F., & Van Oers, R. (2014). *El paisaje urbano histórico. La gestión del patrimonio en un siglo urbano*. Abada Editores.

Berque, A. (2022). *La écoumène: Introducción al estudio de los medios humanos*. Abada Editores.

Careri, F. (2021). *Walkscapes: El andar como práctica estética* (2ª ed.). Gustavo Gili.

Concha Méndez, P., & Avilés Arias, F. (2023). Moverse con las atmósferas: experiencias de cambio y transición en mercados de Santiago en P. Concha Méndez, D. Muñoz Zech, y G. Mora Rivera (Eds.), *Corporalidad y movilidad. Mapeo de lo común y territorios en fricción* (pp. 71–102). RIL editores.

Corboz, A. (2004). El territorio como palimpsesto en A. Martín Ramos, & F. Choay (Eds.). *Lo urbano en 20 autores contemporáneos* (pp. 25-34). Universidad Politécnica de Cataluña.

Fariña Tojo, J. (2006). Formas de regulación de la escena urbana en varias ciudades europeas. *Cuadernos de Investigación Urbanística*, (48), 5-92. <https://polired.upm.es/index.php/ciur/issue/view/68>

Gehl, J. (2020). *La humanización del espacio urbano*. Editorial Reverte. <https://www.reverte.com/media/reverte/files/sample-81190.pdf>

Gutiérrez, R. (2010). Los centros históricos de Iberoamérica. Políticas y improvisaciones. *Cadernos de Arquitetura e Urbanismo*, 16(18+19), 321-335). <https://doi.org/10.5752/P.2316-1752.2009v16n18/19p321>

Jacobs, J. (2011). *Muerte y vida. De las grandes ciudades*. Capitán Swing.

Lefebvre, H. (2013). *La producción del espacio*. Capitán Swing.

Madanipour, A., Knierbein, S., & Degros, A. (Eds.). (2013). *Public Space and the Challenges of Urban Transformation in Europe* (1st ed.). Routledge. <https://doi.org/10.4324/9781315880495>

Martínez Rodríguez, S. (2023). Caminar con los materiales de la ciudad en P. Concha Méndez, D. Muñoz Zech, y G. Mora Rivera (Eds.), *Corporalidad y movilidad. Mapeo de lo común y territorios en fricción* (pp. 39–70). RIL editores.

Ministerio de Educación Pública. (4 de febrero de 1970). *Legisla sobre Monumentos Nacionales; modifica las leyes números 16.617 y 16.719; deroga el decreto ley número 651, de 17 de octubre de 1925* [Ley N° 17.288]. Biblioteca del Congreso Nacional de Chile. <https://bcn.cl/2fkzm>

Mora Rivera, G. (2023). El nacimiento de Kimsantin, la serpiente marsupial que nos cría en bicicletas en P. Concha Méndez, D. Muñoz Zech, y G. Mora Rivera (Eds.), *Corporalidad y movilidad. Mapeo de lo común y territorios en fricción* (pp. 175–206). RIL editores.

Muñoz Zech, D. (2023). Empatía como un «viajar juntos»: lidiando con las diferencias corporales en el viaje acompañado en P. Concha Méndez, D. Muñoz Zech, y G. Mora Rivera (Eds.), *Corporalidad y movilidad. Mapeo de lo común y territorios en fricción* (pp. 281–287). RIL editores.

Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura [UNESCO]. (19 de noviembre de 2015). World Heritage and Sustainable Development policy explained: A guide and a collection of good practices to support development of national policies, programmes and sustainable management of World Heritage properties. UNESCO World Heritage Centre. <https://whc.unesco.org/en/activities/948/>

Ortega, A. (2021). Gestión del patrimonio urbano desde el enfoque de Paisaje Urbano Histórico en Latinoamérica. *URBE. Arquitectura, Ciudad Y Territorio*, (12), 5-19. <https://doi.org/10.29393/UR12-1AGAO10001>

Paul, D., & Valenzuela, C. (2024). Manifestation of Immaterial Culture in the Quinta Normal Heritage Circuit, Santiago de Chile. *Journal of Tourism and Heritage Research*, 7(1), 242-256. <https://www.jthr.es/index.php/journal/article/view/547>

Ponce-Sánchez, A. A., & Cifuentes-Pizarro, I. G. (2025). Patrimonio escénico en áreas urbanas protegidas: primeros resultados de una investigación cualitativa en el mercado tradicional de La Recova, La Serena, Chile. *Revista AUS - Arquitectura / Urbanismo / Sustentabilidad*, (38), 54–62. <https://doi.org/10.4206/aus.2025.n38-06>

Rodríguez, L. (2017). La ciudad como fuente icónica de sentido: aproximaciones desde la cultura geográfica en Valdivia. *Revista AUS – Arquitectura / Urbanismo / Sustentabilidad*, (14), 15–18. <https://doi.org/10.4206/aus.2013.n14-04>

Torrent, H. (2021). *El Plan Serena y la ciudad temática. Planificación y urbanismo en disputa*. RIL editores.

Vergara Álvarez, C., & Concha Méndez, P. (2023). A la deriva: el movimiento como recreación del Yo y el Mundo en P. Concha Méndez, D. Muñoz Zech, y G. Mora Rivera (Eds.), *Corporalidad y movilidad. Mapeo de lo común y territorios en fricción* (pp. 103–124). RIL editores.

RESIDENTIAL SEGREGATION IN A MEXICAN INTERMEDIATE CITY: SOCIO- SPATIAL IN-EQUALITY IN CULIACÁN ROSALES

SEGREGACIÓN RESIDENCIAL EN UNA CIUDAD INTERMEDIA MEXICANA: DESIGUALDAD
SOCIOESPACIAL EN CULIACÁN ROSALES

GERHARD AGUILAR-TORRES 1
RICARDO GÓMEZ-MATURANO 2

- 1 Magíster en Arquitectura y Urbanismo
Estudiante de Doctorado en la Facultad de Arquitectura
Universidad Autónoma de Sinaloa, Culiacán, México
<https://orcid.org/0000-0003-1799-3822>
gerhardaguilar@uas.edu.mx
- 2 Doctor en Urbanismo
Profesor investigador, sección Estudio de Posgrado e Investigación
Escuela Superior de Ingeniería y Arquitectura,
Unidad Tecamachalco del IPN
Instituto Politécnico Nacional, Ciudad de México, México
<https://orcid.org/0000-0002-8027-8648>
rgomezma@ipn.mx

La segregación residencial constituye un mecanismo central en la reproducción de la desigualdad socioespacial en las ciudades contemporáneas y adquiere una expresión particular en las ciudades intermedias latinoamericanas, donde la proximidad física entre sectores sociales no necesariamente se traduce en integración. Este artículo analiza los patrones de segregación residencial en Culiacán Rosales, México, a partir de la distribución espacial de la condición socioeconómica a escala de manzana censal. Con información del censo de población y vivienda de 2020, se construyó un índice sintético de condición socioeconómica mediante análisis de componentes principales y se evaluó su distribución territorial mediante el índice de Moran global y los indicadores locales de asociación espacial, técnicas que permiten identificar la tendencia de los valores similares a agruparse en el territorio. Los resultados muestran una organización espacial fuertemente estructurada, con clústeres de alta y baja condición socioeconómica que concentran el 46,66 % de las manzanas analizadas, mientras que las configuraciones de mezcla socioeconómica local resultan estadísticamente excepcionales. Esta evidencia indica que la desigualdad en Culiacán se organiza en una geografía de fragmentación microterritorial, donde la proximidad física entre enclaves contrastantes no produce integración. El estudio aporta al debate sobre la fragmentación urbana en ciudades intermedias latinoamericanas al mostrar que esta escala urbana no reproduce mecánicamente el patrón centro-periferia de las metrópolis, sino que configura una lógica espacial específica, relevante para el diseño de políticas de equidad territorial.

Palabras clave: segregación residencial, desigualdad socioespacial, ciudades intermedias, fragmentación urbana, Culiacán Rosales

Residential segregation is a key mechanism in the reproduction of socio-spatial inequality in contemporary cities. It takes on a particular form in Latin American intermediate cities, where physical proximity between social groups does not necessarily translate into integration. This article analyzes the residential segregation patterns in Culiacán Rosales, Mexico, based on the spatial distribution of socioeconomic conditions at the census block scale. Using data from the 2020 population and housing census, a synthetic index of socioeconomic conditions was constructed via principal component analysis, and its territorial distribution was assessed using Global Moran's I index and local spatial association indicators, which identify the tendency for similar values to cluster across the territory. The results show a strongly structured spatial organization, with high- and low-socioeconomic clusters accounting for 46.66% of the analyzed blocks, while configurations of local socioeconomic mixing remain statistically marginal. This evidence indicates that inequality in Culiacán is organized by a geography of micro-territorial fragmentation, where physical proximity between contrasting settlements does not produce integration. The study contributes to the debate on urban fragmentation in Latin American intermediate cities, showing that this urban scale does not mechanically reproduce the metropolis center-periphery pattern, but rather a specific spatial logic relevant to the design of territorial equity policies.

Keywords: residential segregation, socio-spatial inequality, intermediate cities, urban fragmentation, Culiacán Rosales

I. INTRODUCTION

Residential segregation is one of the structural features of contemporary cities and a central mechanism in the reproduction of socio-spatial inequality (Rodríguez Vignoli & Arriagada, 2004; Sabatini, 2006). In the 21st century, its expressions have become more complex than those associated with classical segregation based on the physical distance between social groups: today, economic, symbolic and territorial mechanisms operate that produce separation even in conditions of immediate spatial proximity (Janoschka, 2002; Sposito, 2024).

In this scenario, intermediate cities acquire analytical relevance distinct from that of large metropolises, since they allow us to observe more clearly the coexistence of physical proximity and social distance between adjacent sectors. Recent literature has identified them as areas where urban fragmentation manifests in a specific way, rather than as a reduced replica of the metropolitan pattern (Bellet Sanfeliu & Lasala Fortea, 2025; Gómez-Maturano, 2024). This configuration challenges traditional analysis models based on center-periphery gradients (Borsdorf, 2003).

Culiacán Rosales is a relevant case study to examine these processes in the Mexican context. Previous research has documented its transition from a dual urban structure to progressively fragmented configurations (Pérez-Tamayo et al., 2017) and has identified territorial inequalities in access to housing and services (Rodríguez González et al., 2018; Valle Campos, 2025). This background information has mainly addressed the morphological dimension of fragmentation or the sectoral aspects of urban backwardness. A question remains less developed about what the socio-spatial organization of the socioeconomic condition reveals about contemporary modes of segregation in Mexican intermediate cities: whether they reproduce the classic center-periphery pattern, whether they configure a geography of specific fragmentation, or whether they require interpretative frameworks different from those developed for metropolises.

Addressing this issue requires an analysis that connects the multidimensionality of the socioeconomic condition and its territorial expression at a fine intra-urban scale, integrating Principal Component Analysis (PCA) with spatial statistical techniques (Anselin, 2020).

Under these premises, the article analyzes the residential segregation patterns in Culiacán Rosales from the spatial distribution of socioeconomic status at the census block scale. The central argument is

that segregation in Culiacán does not follow a linear center-periphery pattern, but rather a logic of micro-territorial fragmentation, in which clusters of high and low socioeconomic status coexist in physical proximity without producing integration. The contribution consists of offering disaggregated empirical evidence, interpreting this configuration as an expression of urban fragmentation in a Mexican intermediate city, and discussing its implications for planning oriented to territorial equity.

II. THEORETICAL FRAMEWORK

Socio-spatial inequality and residential segregation

Socio-spatial inequality refers to the systematically differentiated distribution of opportunities, resources and living conditions in urban space, produced by mechanisms that combine the organization of the territory with the social relations that configure it (Pérez-Campuzano, 2011; Ziccardi & Dammert, 2021). As a relational phenomenon, it is not limited to expressing a social hierarchy on the cartographic plane, but rather it operates as a mechanism of its own reproduction: the place where one resides conditions access to infrastructure, services, labor markets and urban goods, which generate neighborhood effects on collective trajectories (Fernández Tapia, 2020; Cruz-Sandoval et al., 2025). Residential segregation constitutes a particular—and particularly dense—expression of this inequality: the modality by which social groups are spread across the territory, forming patterns of internal homogeneity and external differentiation (Rodríguez Vignoli, 2001; Rodríguez Vignoli & Arriagada, 2004).

The critical literature has placed the production of these patterns in the modes of social and economic organization of urban space (Castells, 1974), which recognizes that the social division of space in Latin American cities operates through the connection between the land market, unequal provision of infrastructure, and the differentiation in the residential offer (Duhau, 2021; Schteingart, 2001). Segregation, therefore, is not a static state but a process by which inequalities are inscribed in the territory and contribute to reorganizing it.

The proposal by Sabatini (2006) operationalizes segregation in three dimensions: spatial concentration, social homogeneity, and prestige or territorial stigma. Spatial and statistical indicators can capture the first two, whereas the third concerns social assessments of the place of residence. This article addresses the objective dimensions of segregation, which are recognized as limitations, whereas the subjective dimension requires qualitative or mixed approaches.

From the dual city to the fragmented city

The classical reading of the Latin American model of urban organization described a center-periphery structure, based on the differentiation between better-served, consolidated areas, on the one hand, and popular peripheries with less urban development, on the other. However, this should not be interpreted as a mechanical or permanent correspondence between elites and the Historical Center. Since the mid-20th century, in several Latin American metropolises, higher-income groups have begun to move towards new centralities, suburban lines, and low-density residential enclaves, in a process linked to the expansion of the automobile, the selective valorization of land, and the private production of differentiated residential spaces. In this context, the urban literature of the early 21st century suggested that the center-periphery model had ceased to be sufficient as a single explanation of Latin American urban segregation, which proposes the fragmented city model: a geography of discontinuous enclaves where sectors of high and low socioeconomic status can coexist in physical proximity, but remain separated by material, symbolic and functional barriers (Borsdorf, 2003; Janoschka, 2002).

This conceptual transition does not imply the disappearance of the center-periphery pattern, but rather its superposition with a logic of fragmentation, expressed in the proliferation of closed subdivisions, the dispersion of centralities, and the intensive differentiation of residential spaces at fine scales (Rodríguez Vignoli & Arriagada, 2004). More recently, the literature has extended this discussion to the study of intermediate cities, showing that fragmentation is not restricted to large metropolises and that it takes specific forms at this urban scale (Bellet Sanfeliu & Lasala Fortea, 2025; Gómez-Maturano, 2024; Sposito, 2024).

In these contexts, the intermediate scale allows for greater clarity in observing the coexistence of physical proximity and social distance: enclosed enclaves, popular urbanizations, and consolidating peripheries are located at short distances, making fragmentation visible that, in metropolises, can be diluted into extensive gradients. Thus, micro-territoriality — socioeconomically homogeneous clusters of small size and sharp edges — acquires analytical centrality. This reading is consistent with Pérez-Tamayo et al. (2017), who documented a transition from the dual structure to fragmented configurations in Culiacán.

The empirical characterization of this fragmentation requires instruments capable of identifying groupings of spatial units with similar values and discriminating random configurations from structured ones. Spatial autocorrelation — the tendency of a variable's values to cluster spatially more frequently than expected by chance (Anselin, 2020) — offers this capability and links the theoretical debate on fragmentation to its

observable empirical expression, an operational translation developed in the methodological section.

III. CASE STUDY:

CULIACÁN ROSALES AS AN INTERMEDIATE CITY OF THE MEXICAN NORTHWEST

Culiacán Rosales, the capital of Sinaloa, is the state's main urban nucleus and an important intermediate city in the Mexican northwest. According to the 2020 Population and Housing Census of the National Institute of Statistics and Geography (INEGI), the city had a population of 808,416 inhabitants and its metropolitan area 1,003,530, positioning it as one of the main urban agglomerations in the country (INEGI, 2020). Its economy is based on agribusiness, commerce, services, and state public administration, giving it a regionally strategic urban profile.

In recent decades, the city has experienced unequal peripheral expansion, the proliferation of closed subdivisions, and a differentiated distribution of infrastructure and services (Rodríguez González et al., 2018; Valle Campos, 2025). Previous studies documented a transition from dual-city features to fragmented configurations between 2000 and 2010 (Pérez-Tamayo et al., 2017). The analysis using 2020 data allows us to examine whether this transition is consolidated within a geography of socioeconomic clusters at the block scale, making Culiacán a relevant case for discussing residential segregation in intermediate Mexican cities.

IV. METHODOLOGY

This article develops a quantitative research study of an exploratory-descriptive scope, based on multivariate spatial analysis of urban socioeconomic conditions at the intra-urban scale. The methodological strategy combines dimensionality-reduction techniques to construct a synthetic index and spatial autocorrelation techniques to evaluate its territorial organization.

Unit of analysis and data source

The unit of analysis is the census block, defined by the National Institute of Statistics and Geography (INEGI) as the smallest unit of territorial aggregation with publishable statistical representativeness. Its choice aligns with the hypothesis of micro-territorial fragmentation: larger units — Basic Geostatistical Areas (BGAs), neighborhoods, or sectors — could dilute local contrasts. In addition, working with small units mitigates, but does not eliminate, the effects of the modifiable area unit (MAUP) problem. The primary source is the 2020 Population and Housing Census (INEGI,



Figure 1. Methodological scheme of the analysis of residential segregation in Culiacán Rosales. Source: Prepared by the authors.

Category	Variables	INEGI Code	Absolute load
Education	Population 15+ with incomplete elementary education	P15BASIC_INCO	0.664
	Average grade of schooling	GRADO_EDU	0.739
	Population 15+ literate	P15YM_ALFA	0.465
	Population aged 6-11 years attending school	P6A11_AE	0.044
	Population aged 12-14 years attending school	P12A14_AE	0.035
Housing	Dwellings with more than 2.5 occupants per bedroom	VPH_2Y5_DORM	0.573
	Homes with a water tank	VPH_TINACO	0.556
	Housing with a toilet	VPH_EXCSA	0.490
	Housing with drainage	VPH_DRENAJ	0.429
	Homes with piped water	VPH_AGUADV	0.382
	Homes with electricity	VPH_C_ELEC	0.334
Goods	Homes with a car or van	VPH_AUTOM	0.797
	Homes with a washing machine	VPH_LAVAD	0.648
Technology and connectivity	Homes without internet	VPH_INTER	0.817
	Homes with digital services (streaming)	VPH_SPMVPI	0.784
	Homes with pay TV service	VPH_STVP	0.744
Health	Population affiliated with health services	PDER_SS	0.492
	Population affiliated with another health institution	PAFIL_OTRAI	0.397
	Population without affiliation with health services	PSINDER	0.068

Table 1. Variables with the greatest weight on the first main component. Source: Preparation by the Authors based on data from INEGI (2020).

2020). Statistical processing was performed in R, spatial autocorrelation in GeoDe, and mapping in QGIS. Figure 1 summarizes the methodological flow.

Construction of the synthetic index: Analysis of the main components

The socioeconomic condition was operationalized as a multidimensional construct comprising 19 indicators across

education, housing, goods, technology and connectivity, and health, in line with the Latin American literature on intra-urban measurement (Buzai & Montes, 2021). The PCA was applied to 13,531 blocks with complete information on the 19 variables. After statistical confidentiality, the spatial analysis was restricted to the 11,344 blocks that constitute the continuous urban sprawl. Table 1 reports the indicators used, grouped by category, along with their factor load on the first component.

The relevance of the procedure was evaluated using the Kaiser-Meyer-Olkin index (KMO) and the Bartlett sphericity test, statistical criteria for assessing whether the correlation matrix is suitable for Principal Component Analysis (PCA). These statistics are reported in the methodology to document the validity of the index construction procedure prior to its spatial analysis. The first component was used as a synthetic index because it captures the largest share of the variance and represents the dominant socioeconomic gradient among the variables analyzed. The factor scores were set up so that the higher values represented better socioeconomic conditions, since the sign of the component in PCA is arbitrary. The substantive interpretation of the factor loads and the resulting categories is presented in the Results section.

Spatial autocorrelation analysis

To assess whether socioeconomic status was randomly distributed or clustered spatially, global and local spatial autocorrelation analyses were conducted. The Moran's Global Index enabled estimation of the overall intensity of spatial clustering in the socioeconomic index. At the same time, the Local Indicators of Spatial Association (LISA) identified High-High, Low-Low, High-Low, and Low-High clusters. The analysis was performed in GeoDa using a spatial weight matrix based on the six Nearest Neighbors (k-Nearest Neighbors, KNN; $k = 6$), with 999 permutations. This choice made it possible to assign a fixed number of neighbors to each census block and to reduce problems arising from isolated units or geometric discontinuities in the urban fabric.

V. RESULTS

Spatial distribution of socio-economic status

The application of the PCA produced statistically consistent results. The Kaiser-Meyer-Olkin measure was 0.865, indicating adequate correlation structure among the variables; the Bartlett test was significant, $\chi^2(171) = 165\,133.2$, $p < 0.001$, confirming the relevance of the procedure. The first component presented an eigenvalue of 5.868 and explained 30.88% of the total variance. The indicators did not contribute with the same weight to the index: the highest absolute loads corresponded to internet availability (0.817), automobile (0.797), digital services (0.784), pay television (0.744), and educational level (0.739), which indicates that the component mainly synthesizes differences related to educational capital and the availability of goods and services in housing. A synthetic socio-economic condition index was constructed from this component, covering 11,344 blocks within the continuous urban area.

Category	Blocks	Percentage
Very low	1250	11.02%
Low	3,437	30.30%
Medium	3,410	30.06%
High	2,700	23.80%
Very high	547	4.82%
Total	11,344	100%

Table 2. Distribution of blocks according to socioeconomic condition (Culiacán Rosales, 2020). Source: Preparation by the Authors based on data from INEGI (2020).

To obtain the distribution presented in Table 2, the index was classified into five groups using the Jenks natural rupture method. This procedure identifies internal cut-off points that maximize homogeneity within each class and differentiation between classes. Therefore, the very low, low, medium, high, and very high categories do not constitute absolute thresholds of poverty or wealth, but relative positions within the socio-economic structure of Culiacán Rosales.

The distribution shows that the low and medium categories together account for 60.36% of the blocks, while the high and very high categories account for 28.62%. In substantive terms, the blocks classified as very high correspond to units in which the variables with the greatest factorial weight—internet availability, automobile, digital services, pay television, and educational level—have the greatest relative presence. In contrast, the blocks with very low condition show lower availability of these aspects and a greater association with indicators of educational and housing backwardness.

These results describe the socioeconomic composition of the area, but not its spatial organization; the subsequent autocorrelation analyses evaluate whether these categories form significant territorial groupings (Figure 2).

Global spatial autocorrelation of the socio-economic index

The calculation of Moran's Global Index on the socioeconomic index yielded a value of $I = 0.805$ (pseudo p -value = 0.001; 999 permutations). This result indicates a very high positive spatial autocorrelation, confirming a strong tendency for blocks with similar socioeconomic conditions to cluster territorially (Figure 3). The socioeconomic conditions of blocks are not randomly distributed but form a systematic and statistically significant spatial structure.

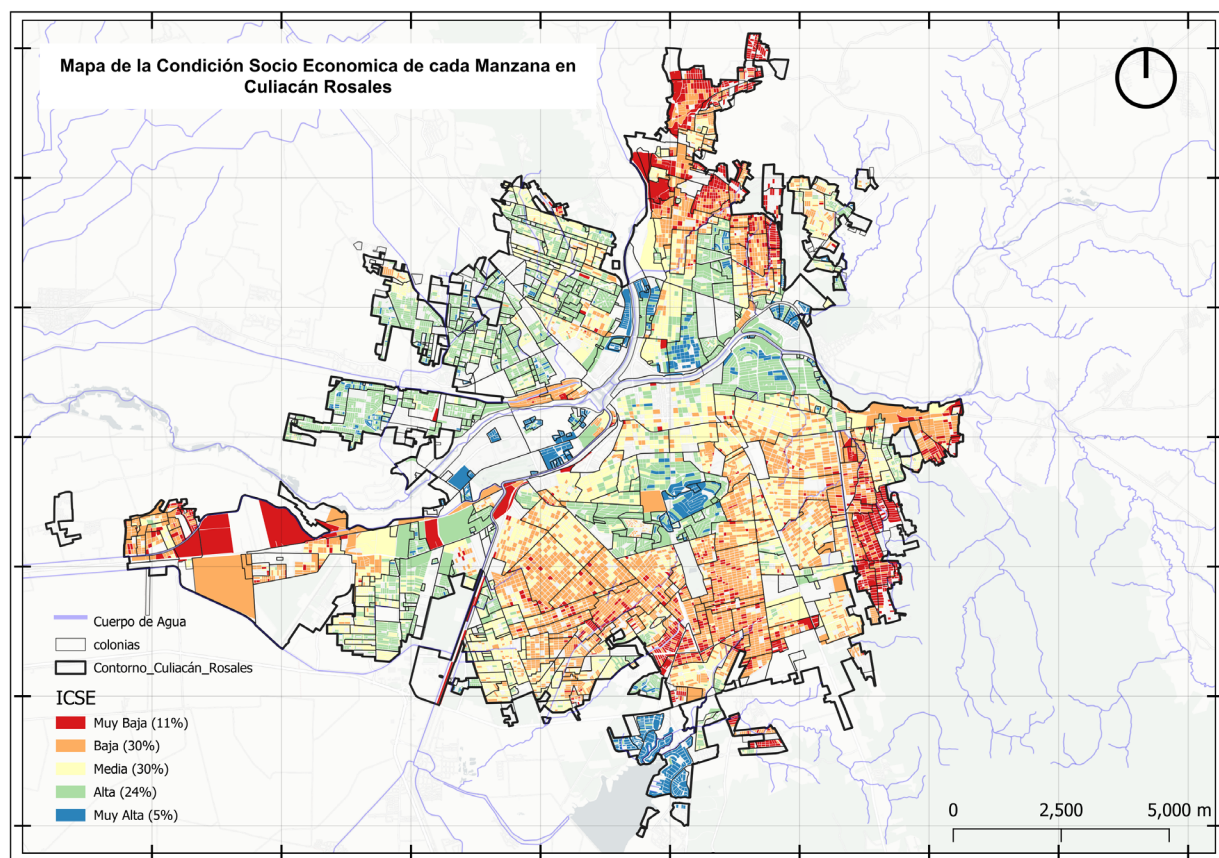


Figure 2. Spatial distribution of the socio-economic condition index (PCA) at the census block level in Culiacán Rosales, 2020. Source: Preparation by the Authors based on INEGI (2020).

Local geography of the fragmentation: LISA analysis

To identify the local geography of the spatial organization, the LISA procedure was applied, which decomposes Moran's Global Index into its contributions by spatial unit and classifies each block into one of five categories according to the relationship between its value and those of its immediate neighborhood: High-High (HH), Low-Low (LL), High-Low (HL), Low-High (LH) and not significant. Table 3 reports the resulting distribution.

Three features emerge as a central finding. First, the HH and LL clusters total 5,293 blocks (46.66% of the urban fabric), which express concentration with social homogeneity — the two objective dimensions of segregation. Secondly, the HL and LH clusters together account for less than 1%, indicating that situations of proximity without homogeneity are statistically exceptional; transitions between clusters occur by sharp edges. Thirdly, HH (23.28%) and LL (23.38%) are close in magnitude. However, the high and very high condition blocks (28.62% of the universe) are grouped in significant HH clusters at a higher

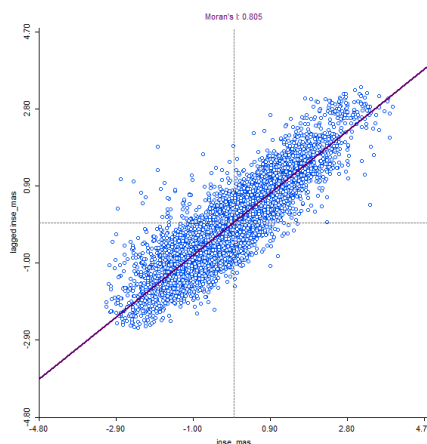


Figure 3. Moran scatter diagram for the socio-economic condition index (PCA) at the census block level in Culiacán Rosales. Source: Preparation by the Authors based on PCA results.

LISA Category	Blocks	Percentage
High-High (HH)	2 641	23.28%
Low-Low (LL)	2 652	23.38%
High-Low (HL)	56	0.49%
Low-High (LH)	49	0.43%
Not significant	5 946	52.42%

Table 3: Distribution of blocks according to the LISA category of the socio-economic condition index (Culiacán Rosales, 2020). Source: Prepared by the Authors based on the results of the PCA and LISA analysis in GeoDa.

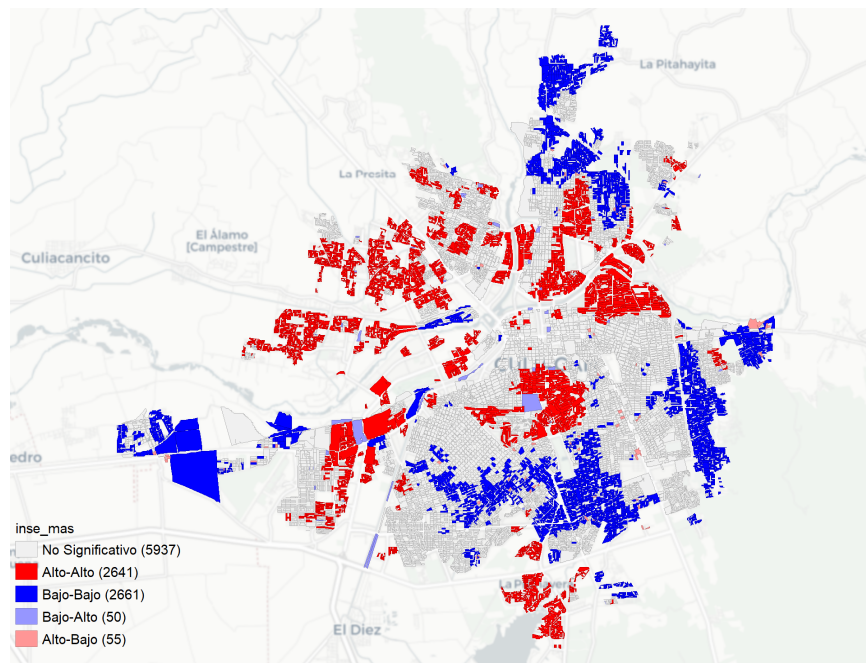


Figure 4. LISA Map (Local Moran) of the socio-economic condition index (PCA) at the census block level in Culiacán Rosales, 2020. Source: Preparation by the Authors based on PCA results.

proportion than the low and very low condition blocks in LL clusters, suggesting that the high condition sectors have a greater propensity for significant clustering.

Identification of local segregation clusters (LISA)

The LISA cartography (Figure 4) reveals three particularities of Culiacán that distinguish its pattern from the classical center-periphery model. The HH clusters do not form a continuous central nucleus, but are distributed as discontinuous enclaves in specific sectors of the north, southeast, and east, associated with high-end residential developments and closed subdivisions; this pattern approaches the fragmented city model (Janoschka, 2002), in which elites are redistributed to

exclusive peripheral enclaves. LL clusters are concentrated on urban edges with a tendency to dispersion, which make up a periphery that is distributed discontinuously along the fronts of recent expansion, where growth has operated by successive addition of social housing subdivisions, popular urbanizations in consolidation, urban voids, and closed developments of greater purchasing power (Ruiz López et al., 2021). The periphery of Culiacán is not a homogeneous strip of poverty but a fragmented one. Finally, the HH and LL clusters are located in nearby sectors without a gradual transition; the low percentage of local mix configurations confirms that this proximity does not produce socio-spatial integration but a coexistence of separate enclaves.

VI. DISCUSSION

The findings allow us to argue that residential segregation in Culiacán does not fully conform to the classic center-periphery model. Although socioeconomic inequality shows a strong spatial organization, its concrete expression does not correspond to a simple concentric pattern — with a continuous core of better conditions opposed to a homogeneous popular periphery — but to a geography of discontinuous enclaves where the sectors with the highest socioeconomic status appear in specific clusters distributed within the urban fabric. The HH clusters are located in specific sectors associated with recent residential developments and closed subdivisions, while the LL appear in scattered urban edges, linked to expansion fronts and popular urbanizations in consolidation. This configuration approximates the case to the fragmented city model, but with a characteristic feature of the intermediate scale: the physical proximity between contrasting clusters makes the socio-spatial separation more visible, without producing effective mixing.

This result is in direct dialogue with the recent literature on intermediate cities (Bellet Sanfeliu & Lasala Fortea, 2025; Gómez-Maturano, 2024; Sposito, 2024), which has pointed out that the intermediate scale can make the physical proximity between contrasting social sectors more visible. However, the Culiacán data nuance the idea that such spatial proximity alone favors socio-spatial integration: proximity exists, but it does not generate mixing. The intermediate scale produces a sharper visibility of the separation, not necessarily its overcoming. This morphological reading should be understood as partial, since urban integration also depends on symbolic barriers, practices of social distinction, and socio-cultural mechanisms that are not directly captured by the census data used in this study. The article thus provides evidence that urban fragmentation in Mexican intermediate cities should not be understood as a reduced version of the metropolitan pattern, but as its own configuration where the territorial proximity between contrasting enclaves coexists with material, symbolic, and socio-cultural barriers that maintain separation.

These patterns are consistent with previously documented urban processes for Culiacán. The discontinuous location of the HH clusters dialogues with the proliferation of closed subdivisions and with selective dynamics of real estate capital oriented towards sectors with greater potential for land valorization (Rodríguez González et al., 2018). The spread of LL clusters along urban edges, on the other hand, is consistent with a peripheral expansion in which social housing, popular urbanizations, urban voids, and developments with greater purchasing power coexist (Ruiz López et al., 2021). Thus, fragmentation operates not only between the center and the periphery, but also within the periphery itself.

Compared to previous studies on Culiacán that mainly addressed

the morphological dimension of fragmentation (Rodríguez González et al., 2018) or sectoral aspects of urban lag (Valle Campos, 2025), this work provides a spatially disaggregated and statistically formalized measurement of the socio-economic organization of the territory, which show that fragmentation is not limited to the presence of specific architectural types, but is translated into a geographical structure of significant socio-economic clusters at the block scale, and that the transition dual city to fragmented city documented by Pérez-Tamayo et al. (2017) that in 2000-2010 was consolidated in the most recent census.

The study has three limitations. The single timeline provides a synchronous snapshot that does not allow for trend analysis. The synthetic index captures the objective dimensions of segregation - concentration and homogeneity - but not the subjective dimension of prestige or stigma (Sabatini, 2006), which requires qualitative or mixed approaches. The analysis does not include variables such as land value or location of workspaces, whose incorporation would enrich the examination of the links between the real estate market and segregation patterns.

Future studies include the intercensal analysis of fragmentation dynamics, the articulation with land-market data, qualitative approaches to the subjective dimension of segregation, and the systematic comparison with other Mexican intermediate cities.

The contribution of the study is placed in three planes: it offers disaggregated empirical evidence on a Mexican intermediate city; it shows that this evidence is consistent with a logic of micro-territorial fragmentation specific to the intermediate scale; and it suggests that territorial equity policies in this urban type should assume that physical proximity does not guarantee integration.

VII. CONCLUSIONS

The study analyzed patterns of residential segregation in Culiacán Rosales using a synthetic socioeconomic status index at the census block scale and its spatial analysis. The results show that the socioeconomic conditions of the territory are not randomly distributed, but are organized into statistically significant, homogeneous clusters that cover 46.66% of the urban fabric. In comparison, the configurations of local socio-spatial mixture are statistically exceptional (< 1%). This evidence supports the central idea of the work: segregation in Culiacán does not follow a linear center-periphery pattern, but rather a logic of micro-territorial fragmentation.

Beyond the case, the study clarifies the recent hypothesis that the intermediate scale would favor socio-spatial integration by reducing the distances between social sectors. In Culiacán, the physical proximity between contrasting enclaves is real,

but it does not produce integration. The intermediate scale makes the separation visible; it does not dissolve it. Urban fragmentation in Mexican intermediate cities is not a reduced version of the metropolitan model, but a configuration of its own.

The scope of the study requires recognizing its limits. The measurement captures the objective dimensions of segregation, but leaves out territorial prestige; the synchronous cut does not allow for reading fragmentation as a temporal process; and the set of census variables does not incorporate the land market or the location of employment, mechanisms that literature has identified as central to contemporary fragmentation. These limits outline the agenda within which the work is inscribed, as a starting point, not as closure. The implications for territorial equity planning are direct: the micro-scale constitutes a relevant level of intervention, and public action must assume that proximity does not guarantee integration.

VIII. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, G. A. T. & R. G.-M. Data Curation, G. A. T. & R. G.-M.; Formal analysis, G. A. T.; Acquisition of financing, G. A. T.; Research, G. A. T.; Methodology, G. A.T.; Project Management, G. A. T.; Resources, G. A.T.; Software, G. A. T.; Supervision, G. A. T.; Validation, G. A. T.; Visualization, G. A. T.; Writing - original draft, R.G.-M.; Writing - revision and editing, R. G.-M.

IX. BIBLIOGRAPHIC REFERENCES

Anselin, L. (2020). *Spatial econometrics: Methods and models*. Springer. <https://doi.org/10.1007/978-94-015-7799-1>

Bellet Sanfeliu, C., & Lasala Fortea, J. (2025). Geographies of unequal dwelling: Lived fragmentation and everyday trajectories in Lleida. *Boletín de la Asociación de Geógrafos Españoles*, (106). <https://doi.org/10.21138/bage.3763>

Borsdorf, A. (2003). Cómo modelar el desarrollo y la dinámica de la ciudad latinoamericana. *Revista EURE- Revista de Estudios Urbano Regionales*, 29(86), 37–49. <https://doi.org/10.4067/S0250-71612003008600002>

Buzai, G. D., & Montes Galbán, E. J. (2021). *Estadística espacial: Fundamentos y aplicación con Sistemas de Información Geográfica*. Universidad Nacional de Luján.

Castells, M. (1974). *La cuestión urbana*. Siglo XXI Editores.

Cruz-Sandoval, M., Gómez Zaldivar, F., Peraza-Mues, G., & Ponce-López, R. (2025). The interplay of economic complexity and urban sprawl in shaping socio-spatial segregation in Mexico. *Applied Geography*, 181, 103690. <https://doi.org/10.1016/j.apgeog.2025.103690>

Duhau, E. (2021). División social del espacio metropolitano y movilidad residencial. *Papeles de Población*, 9(36), 161–210. <https://rppoblacion.uaemex.mx/article/view/17222>

Fernández Tapia, J. (2020). Segregación socioespacial y bienestar en las ciudades de México, 2000–2020. *Pacha. Revista de Estudios Contemporáneos del Sur Global*, 1(3), 120–142. <https://revistapacha.religacion.com/index.php/about/article/view/36/57>

Gómez-Maturano, R. (2024). ¿Ciudad fragmentada o desintegrada? Los modelos urbanos aplicados a las ciudades intermedias en México desde la geodemografía. *Urbano*, 27(49), 108–121. <https://doi.org/10.22320/07183607.2024.27.49.08>

Instituto Nacional de Estadística y Geografía [INEGI]. (2020). *Censo de Población y Vivienda 2020*. Instituto Nacional de Estadística y Geografía. <https://www.inegi.org.mx>

Janoschka, M. (2002). El nuevo modelo de la ciudad latinoamericana: Fragmentación y privatización. *Revista EURE- Revista de Estudios Urbano Regionales*, 28(85), 11–20. <https://doi.org/10.4067/S0250-71612002008500002>

Pérez-Campuzano, E. (2011). Segregación socioespacial urbana: Debates contemporáneos e implicaciones para las ciudades mexicanas. *Estudios Demográficos y Urbanos*, 26(2), 403–432. <https://doi.org/10.24201/edu.v26i2.1388>

Pérez-Tamayo, B. N., Gil-Alonso, F., & Bayona-I-Carrasco, J. (2017). La segregación socioespacial en Culiacán, México (2000–2010): ¿De la ciudad dual a la ciudad fragmentada? *Estudios Demográficos y Urbanos*, 32(3), 547–591. <https://doi.org/10.24201/edu.v32i3.1660>

Rodríguez González, S. C., Acosta Rendón, J. J., Pérez Peñuelas, B. O., & Acosta Lugo, J. L. (2018). Los fraccionamientos cerrados en la fragmentación urbana de Culiacán Rosales, Sinaloa. Configuración de nuevas centralidades del encerramiento. *Topofilia*, (17), 163–177. <https://topofilia.buap.mx/index.php/topofilia/article/view/33>

Rodríguez Vignoli, J. (2001). *Segregación residencial socioeconómica: ¿Qué es?, ¿cómo se mide?, ¿qué está pasando?, ¿importa?*. Cepal. <https://hdl.handle.net/11362/7149>

Rodríguez Vignoli, J., & Arriagada, C. (2004). Segregación residencial en la ciudad latinoamericana. *Revista EURE- Revista de Estudios Urbano Regionales*, 30(89), 5–24. <https://doi.org/10.4067/S0250-71612004008900001>

Ruiz López, C. F., Vieyra, A., & Méndez-Lemus, Y. (2021). Segregación y singularidades en el periurbano de ciudades medias mexicanas en A. Carrión Hurtado y M. F. López-Sandoval (Coords.), *Ciudades intermedias y nueva ruralidad* (pp. 114-135). Editorial FLACSO Ecuador

Sabatini, F. (2006). *La segregación social del espacio en las ciudades de América Latina*. Banco Interamericano de Desarrollo, Departamento de Desarrollo Sostenible. <https://doi.org/10.18235/0009848>

Schteingart, M. (2001). La división social del espacio en las ciudades. *Perfiles Latinoamericanos*, 9(19), 13–31. <https://perfilesa.flacso.edu.mx/index.php/perfilesa/article/view/314>

Sposito, M. E. B. (2024). Fragmentación socioespacial y urbanización contemporánea. *Estudios Socioterritoriales*, 35, 9–32. <https://doi.org/10.37838/unicen/est.35-101>

Valle Campos, F. A. (2025). Desigualdad en servicios básicos y vivienda adecuada: Análisis espacial en Culiacán Rosales, Sinaloa. *Vivienda y Comunidades Sustentables*, (18), 57-78. <https://doi.org/10.32870/rvcs.v0i18.319>

Ziccardi, A., & Dammert, M. (2021). Las desigualdades urbanas y el derecho a la ciudad. *Desacatos*, (67), 82–91. <https://desacatos.ciesas.edu.mx/index.php/Desacatos/article/view/2435>

X. ACKNOWLEDGMENTS

We would like to thank the Editorial Team and the evaluators of Revista Urbano for their comments and suggestions during the review process.

NAMING AND REGULATING: TENSIONS BETWEEN URBAN PLANNING AND PRODUCTION OF NATURE¹

NOMBRAR Y NORMAT: TENSIONES ENTRE LA PLANIFICACIÓN URBANA Y LA PRODUCCIÓN DE NATURALEZA

CLAUDIA CERDA-INOSTROZA ²
FRANCISCO DE-LA-BARRERA-MELGAREJO ³
MAURO FONTANA-FLORES ⁴

¹ Agencia Nacional de Investigación y Desarrollo (ANID) a través de la Beca Doctorado Nacional 2024, N° 21241110, Fondo Nacional de Desarrollo Científico y Tecnológico FONDECYT N°1231859, N°11260874 y Centro de Interés Nacional CEDEUS CIN250009

² Magíster en Procesos Urbanos Sostenibles
Estudiante de Doctorado en Estudios Territoriales del Sur global.
Jefa de carrera de la Facultad de Arquitectura, Urbanismo y Geografía
investigadora del Grupo de estudios Interculturales Urbanos y Territoriales (GRIUT)
Universidad de Concepción, Concepción, Chile
<https://orcid.org/0000-0002-8864-7516>
clcerda@udec.cl

³ Doctor en Geografía, Planificación Territorial y Gestión Ambiental
Docente e Investigador de la Facultad de Ciencias Ambientales.
Centro de Ciencias Ambientales (EULA-Chile) y Centro de Desarrollo Urbano Sustentable (CEDEUS)
Universidad de Concepción, Concepción, Chile
<https://orcid.org/0000-0002-6854-3197>
fdelabarrera@udec.cl

⁴ Doctor en Arquitectura y Estudios Urbanos
Director del Departamento de Urbanismo de la Facultad de Arquitectura, Urbanismo y Geografía.
Grupo de estudios Interculturales Urbanos y Territoriales (GRIUT)
Universidad de Concepción, Concepción, Chile
<https://orcid.org/0000-0002-2818-4863>
maurofontana@udec.cl

Los instrumentos de planificación urbana producen naturaleza a través de procesos de zonificación, que generan tensiones en la forma en que estos espacios son nombrados y normados. Este trabajo busca identificar y comparar los modos de producción de la naturaleza en el Área Metropolitana de Concepción, a partir del análisis de instrumentos de planificación territorial en distintos períodos sociohistóricos. Para ello, se utilizó un enfoque metodológico mixto que combinó el análisis de discurso, la revisión documental y las entrevistas semiestructuradas. Los resultados demuestran la subordinación de la naturaleza a funciones socioeconómicas, pese al incremento de la semántica ambiental en los instrumentos de planeación; ello indica la necesidad de transparentar el lenguaje técnico y reconocer múltiples significados de la naturaleza para su integración efectiva en la planificación de la ciudad.

Palabras clave: planificación urbana, naturaleza urbana, instrumentos de planificación, discursos urbanos

Urban planning instruments produce nature through zoning, creating tensions in how these spaces are named and regulated. This study aims to identify and compare the modes of production of nature in Concepción's Metropolitan Area by analyzing the planning instruments in different socio-historical periods. For this analysis, a mixed-methods approach that combined critical discourse analysis, document review, and semi-structured interviews was used. The results show that nature is subordinated to socio-economic functions, despite the increased emphasis on environmental semantics in planning instruments. This demonstrates the need to make technical language more transparent and to recognize nature's multiple meanings for its effective integration into city planning.

Keywords: urban planning, urban nature, planning instruments, urban discourses

I. INTRODUCTION

From semantic to normative discourse: How planning reconfigures nature with words

In urban planning instruments, the language used to designate areas recognized as nature serves not only as a descriptive technical tool but also as a means of reconfiguring the territory's meaning. The terms used in the definition of natural areas, far from being neutral, play a central role in constructing different visions that guide their relationship with urban processes, which operate as discursive practices that directly affect the production of natural space (Fairclough, 1992; Foucault, 1977).

The nomenclature used to define these zones often does not align with standardized frameworks or formally consolidated categories; rather, it emerges from discretionary decisions by officials or technical entities, programmatic orientations, and/or institutional guidelines. Language guides how the territory is intervened in, simplifying the ecological complexity of the space (Scott, 1998; De la Barrera et al., 2023). This process helps to define which forms of nature are recognized within the planning and which are subordinated or excluded (Van Speybroeck & Targa, 2026).

In critical theory, nature is not conceived as an external entity of society, but as a socially produced category. The notion of "production of nature" helps us understand that natural spaces in the city are not simply preserves of what already existed, but active configurations mediated by economic, technical, and ideological interests, inserted within the circuit of capital (Smith, 2007; Swyngedouw, 2011).

The spaces that contain nature and are the object of urban planning are reconfigured according to various rationalities. Some of these are structured from mercantile logics, linked to real estate valuation processes (Harvey, 1982; Smith, 2007); others are oriented to recreational functions and social cohesion (Gehl, 2011); while others respond to ecological approaches, focused on conservation and restoration (Beatley, 2011). These different logics coexist within urban planning processes, under hierarchies that are not explicit in the instruments (Valencia-Sandoval et al., 2010). Thus, urban planning can be understood as a territorial governance device that not only organizes space but also prioritizes certain modes of production of nature over others (Smith, 2007).

To show how the modes of production of urban nature are configured over time, this article analyzes the relationship between the semantic and regulatory discourses found in the urban planning instruments of

the Metropolitan Area of Concepción (AMC). This territory constitutes a relevant case study for analyzing these tensions, given the convergence of high natural-system diversity and the implementation of intensive urban planning over time.

The study proposes a mixed methodological approach that uses discourse analysis techniques to provide new insights into the structural basis of contemporary socio-environmental conflicts constituted on the territory.

II. THEORETICAL FRAMEWORK

Human-nature power relations

Historically, the concept of nature has been the subject of epistemological disputes, which not only reflect conceptual differences but also tensions over which forms of life and relationships are recognized or excluded within urban systems (Van Speybroeck & Targa, 2026). Nature cannot be understood from a static perspective but as an epistemological horizon in which multiple cultural, geographical, political, and temporal conceptions converge (Swyngedouw, 2011).

From this perspective, the human being occupies a dual position: on the one hand, they are part of the ecosystem; on the other, they act as a transformative agent of history, culture, and territory (Von Mentz, 2012; Santos, 1978). Under this logic, Reclus (1875) uses "second nature" to refer to this permanent intervention, through which human beings modify the environment to survive and expand.

The contemporary environmental crisis shows an intensification of this relationship, which evidences a significant ecological imbalance (Merchant, 2023). In Latin America, colonization established a territorial ordering based on a functional and limited relationship with nature (Walsh, 2007), which consolidates a dualistic vision that separates and subordinates the natural to the human domain (Merchant, 2023). This problem has been exacerbated by a capitalist model that has prioritized urban expansion at the expense of natural systems (Mignolo, 2012).

In Chile, this process has intensified since the 1980s, with the consolidation of the neoliberal model. This has significantly transformed natural landscapes and, together with weak urban planning, has contributed to territorial conflicts and environmental degradation (Hidalgo et al., 2022; Villagra Islas, 2011; Nicolás-Artero et al., 2021).

In this scenario, urban planning is understood as a field in which these tensions manifest, particularly through regulatory instruments that classify and govern the presence and fate of nature in the city from different positions of power.

Nature production and urban planning

From the critical theory, Henri Lefebvre (2014) suggests that the “conceived space”, represented through maps or plans, is not neutral but socially produced. Nowadays, this process is shaped by a capitalist logic in which economic and technical interests predominate, justifying certain forms of spatial organization that shape everyday life.

In this line, the production of nature allows us to understand how the natural is organized and re-signified according to social rationalities (Smith, 2020); in the urban context, this production is mainly expressed in three interrelated modes.

- Economic, where nature is fragmented and re-signified according to land valorization and the accumulation of capital (Harvey, 1982; Smith, 2020).
- Social, focused on the creation of public spaces that favor well-being, interaction, and social cohesion (Gehl, 2011; Jacobs, 2014).
- Environmental, addressing ecological protection and the integration of natural processes in territorial planning (McHarg, 1969; Waldheim, 2016).

These do not operate in isolation but coexist, stressing how urban nature is conceived and regulated. Urban planning instruments not only organize the space but also define the values and functions assigned to each territory. This coexistence has been widely documented in planning processes that seek to balance development, conservation, and social demands, although not always in a symmetrical way (Valencia-Sandoval et al., 2010).

Discourses and regulation in urban planning

Naming and regulating the territory constitute an exercise of power, since they not only define possible uses but also which forms of nature are legitimized or rendered invisible within urban space (Van Speybroeck & Targa, 2026), thereby validating or imposing certain modes of nature production (Smith, 2020).

Discourse analysis has become a key tool in urban studies, as it enables the analysis of how institutional language, regulations, diagnostics, or cartographic representations shape space, guide forms of intervention, and ultimately define what is valid and what is possible (González Redondo, 2024; Shirazi, 2023). Language not only describes space but also classifies and organizes

it by producing different realities, becoming a tool of domination when it is in the hands of those who possess symbolic authority (Bourdieu, 1991; Foucault, 1977).

States simplify territory through legible categories that facilitate its management, but reduce its ecological and social complexity (Scott, 1998). This simplification is not neutral, as it can conceal processes of exclusion in which certain forms of nature are marginalized for not belonging to dominant categories (Harvey, 1996; Van Speybroeck & Targa, 2026). An example of this is urban agriculture, which has yet to secure regulatory status despite its social and environmental potential (Zazo-Moratalla et al., 2023). These discursive practices are usually presented as technical and objective truths, when in fact they respond to specific ideological interests and visions (Fairclough, 1992).

On the other hand, the regulatory dimension translates these representations into concrete regulations, in which nature is frequently instrumentalized for urban development (Lefebvre, 2014). This tends to reinforce reductionist visions that commodify nature under the logic of capital, by making its cultural and ecological dimensions invisible (Leff, 2004; Escobar, 2010). Consequently, urban planning instruments simplify nature through generic categories such as “green areas” instead of recognizing it by its characteristics, such as wetlands or hills (De la Barrera et al., 2023).

Thus, semantics and regulations operate together as instruments of power that determine the fate of urban nature (Harvey, 1982; Lefebvre, 2014). This research examines how the two dimensions are related and together generate modes of production, contrasting with studies of discourse analysis in planning that have focused on language or regulations in isolation.

III. CASE STUDY

The Metropolitan Area of Concepción (AMC), comprising eleven communes, is located in the Biobío region, in the south-central area of Chile (Figure 1). It has a population of 1,012,490 inhabitants in an area characterized by high natural diversity, marked by the Biobío River basin, which encompasses valleys, lagoons, and wetlands, as well as the low-altitude ridges of the Cordillera de la Costa.

Since 1948, the AMC has been the subject of urban planning processes. With 35 regulatory plans passed, the AMC has an extensive track record when compared to Latin American standards, which have marked the reconfiguration of its natural spaces. In the 1960s, industrial growth was accompanied by planning

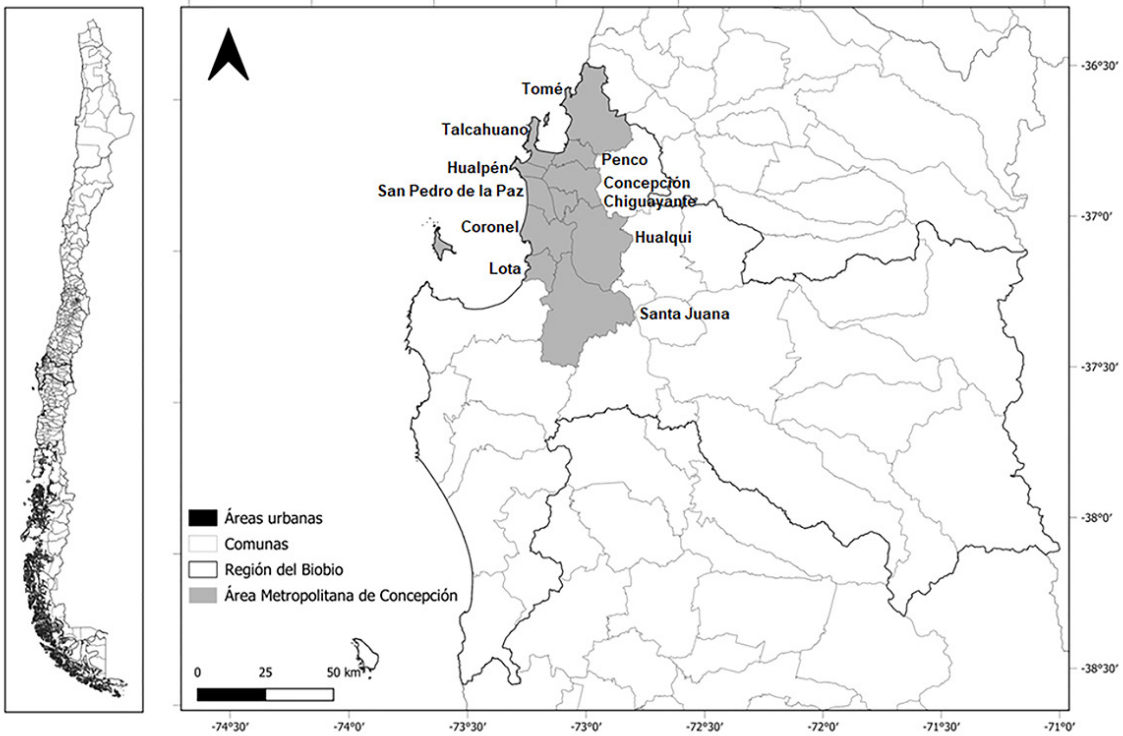


Figure 1. Location of the Metropolitan Area of Concepción. Source: Prepared by the authors.

Years community regulatory plans were passed					
Concepción	1948 [n/a]	1962-64	1982	2004	
Coronel		1963	1983		2013
Talcahuano		n1964 [n/a]	1982	2006	
Hualpén		n1964 [n/a]	1982		2023
San Pedro de la Paz		1966	1982		2011
Penco		1968 [n/a]	1982	2007	
Lota		1969	1983		
Chiguayante			1982	2003	
Santa Juana				2006	
Tomé		1968 [n/a]	1982	2008	
Hualqui		1964	1982		2017
Years metropolitan regulatory plans were passed					
Intercommunal	1949 [n/a]	1963			
Metropolitan			1980	2003	
Note: [n/a]: No background information available in the regulatory plans file.					

Table 1. Passing of the AMC’s communal, intercommunal, and metropolitan regulatory plans. Source: Prepared by the authors.



Figure 2. Methodological outline. Source: Prepared by the Authors.

that unified a group of communes through large infrastructure. This led to the Zoning of the Greater Concepción area and, later, to the Intercommunal Plan of Concepción of 1963. In parallel, the different communes consolidated their own planning processes (Table 1).

IV. METHODOLOGY

In keeping with the adopted theoretical approach, which understands nature as a socio-spatial production, a mixed-methods approach is proposed. This combines qualitative techniques for discourse analysis, mainly used to address the symbolic dimension of urban space and to identify how linguistic categories and institutional representations configure meanings that affect the territory's material production (González Redondo, 2024), with quantitative techniques for systematization through a comparative analysis matrix (Figure 2). This methodological approach has been used in territorial planning studies that combine qualitative analysis, local data collection, and spatial evaluation to address complex development problems (Valencia-Sandoval et al., 2010). The study analyzed how urban nature has been produced in the AMC, based on the zoning proposed by the communal and metropolitan regulatory plans for natural spaces.

Firstly, a documentary review of the regulatory plans passed by the AMC from 1960 onwards was conducted, and their explanatory reports and the context of their preparation were analyzed. In addition, semi-structured interviews were conducted with key urban planning actors, including consultants and public officials. All this is to identify the distinct socio-historical periods that planning has undergone regarding urban nature.

Secondly, the 24 communal and metropolitan regulatory plans that include natural areas within the urban territory were listed. Thirdly, an analysis matrix was built using this to address the semantic and normative dimensions of natural areas, with the semantic dimension understood as the language used to designate the polygons, and the regulatory dimension as the permitted land uses in each area.

For the comparative evaluation, both dimensions were addressed using an approved set of analytical categories that contrast discursive patterns and recurrent categories to analyze the degree of coherence between what is named and what is regulated in the polygons. For this purpose, both the semantic and regulatory discourses were examined using the value (environmental, social, economic, and generic) and function (conservation, recreation, restriction, functional, productive, equipped, and urbanized) categories (Table 2). This methodological decision makes it possible to operationalize the notion of production of nature by making discursive representations and their regulatory materialization comparable.

ANALYTICAL CATEGORIES TO MEASURE THE SEMANTIC AND REGULATORY DIMENSIONS			
VALUE		FUNCTION	
ANALYTICAL CATEGORIES	DESCRIPTION	ANALYTICAL CATEGORIES	DESCRIPTION
Environmental	To maintain the ecological qualities and biodiversity of the spaces, promoting their conservation and ecosystem regulation through land uses compatible with environmental protection.	Conservation	Areas intended to conserve natural spaces and maintain ecological balance, allowing limited human use (E.g., Ecological conservation areas, natural parks).
		Recreation	Areas intended for rest, recreation, and well-being in natural environments (urban green areas, recreational parks, seaside resorts).
Social	To promote recreational spaces that balance natural conservation with accessibility and collective well-being, through uses oriented to leisure and recreation.	Restriction	Areas intended to limit the use of land to protect security, the area, or critical infrastructure (Restriction, natural or anthropogenic hazards).
		Functional	Areas intended to separate incompatible urban uses and mitigate the impacts of high-impact infrastructures (Natural areas or parks).
Economic	To promote productive uses of land reserves for future developments, subordinating ecological and social values to the logic of the market.	Productive	Areas intended for economic activities that transform the area for productive purposes (Agriculture, forestry, mining, productive infrastructure).
		Equipped	Areas with an environmental and recreational function that allow cultural, religious, or commercial facilities (facilities for different uses).
Generic	Category applied to areas identified with letters, symbols, or general names, as well as those that do not define land uses.	Urbanization	Areas intended to integrate housing and equipment where green is relevant, but fragmented (housing and equipment).

Table 2. Analytical categories for the semantic and regulatory dimensions of natural areas of urban planning instruments. Source: Prepared by the authors.

Finally, the results were synthesized into graphs and cartographic representations, enabling a contrast between the semantic and regulatory discourses and showing the different modes of nature production that emerge from the case study.

V. RESULTS

Identification of socio-historical periods of nature recognition in the AMC's urban planning

Based on the analysis of the metropolitan and communal regulatory plans from the mid-20th century onwards, the context in which they were developed, and interviews with experts, four socio-historical periods in which the recognition and production of nature within the AMC evolved were identified and characterized (Table 3).

1. The first period (1960-1979) was characterized by the AMC's industrial expansion, in which natural areas were recognized and regulated mainly with a functional and productive character, regarding the coexistence of industrial and housing areas, under a logic of buffer and green areas.
2. The second period (1980-1999) is characterized by the highest number of the AMC's communal regulatory plans coming into force, in which nature is named and regulated by figures that respond to a mercantile logic, serving the State-led liberalization of the land market.
3. The third period (2000-2010) is characterized by the highest number of zoning designs that recognized natural areas, despite fewer regulatory plans being passed than in the previous period. This is in line with an environmental perspective that permeates institutions and public policies, which seek to ensure greater protection of natural areas within the urban boundary.

	Socio-Historical Periods							
	1960-1979 Industrial poles		1980-1999 Neoliberalization of the land		2000-2009 Common good		2010-2025 Fragmentation of environmental protection	
Number of regulatory plans enacted since 1960	11 (4 N/A)*		11		7		4	
Number of plans that consider natural areas	7		6		7		4	
Identified areas	Urbanized Areas	Natural areas	Urbanized Areas	Natural areas	Urbanized Areas	Natural areas	Urbanized Areas	Natural areas
Total areas	51	12	58	13	160	53	95	26
Percentage of natural areas versus urbanized areas	24%		22%		33%		27%	
Technical-political understanding of nature by period	Nature acquires a functional character limited to complementing industrial areas or to establishing itself as a productive space.		Nature is oriented towards the logic of the land market becoming a tradable good subject to demand.		Nature is beginning to be protected and is destined for public spaces for recreation and to mitigate natural threats.		The protection of nature is transferred to other political entities, fragmenting decision-making in this matter.	

Table 3. Definition of socio-historical periods. Source: Prepared by the authors.

4. A shift in the regulatory recognition of natural areas from regulatory plans to other legal bodies, such as Sanctuaries or the Urban Wetlands Law, marks the fourth period (2011-2025). This is reflected in a decrease in the areas that recognize natural areas.

This path shows a trend towards fewer regulatory plans passed and an increase in the number and specificity of designations assigned to recognized natural areas. The historical average of natural areas relative to urbanized areas does not exceed the 30% reached in 2000. This shows that the designations and regulations assigned to natural areas do not follow a homogeneous pattern but rather reflect a combination of historical, regulatory, and socio-political factors that evolve towards protection figures external to regulatory plans (Table 3).

Contrasts between semantic and regulatory discourse

From a critical reading of socio-historical periods, it is evident how the language of planning can operate as a symbolic device that does not always translate into a

coherent action on the territory. In accordance with the methodological strategy, the analysis is organized around a comparison of the semantic and normative discourses of natural areas, which consider the assigned values and functions that form the basis for identifying nature's modes of production.

Contrasts between the semantic and regulatory discourses of nature production in metropolitan planning instruments

Eleven areas associated with nature were identified in the metropolitan planning, which evolved from a functional and reductionist language, whose names do not recognize the geomorphological particularities of the place (e.g., forest parks, recreation areas or ecological protection areas), towards an increasing semantic technification that incorporates environmental valorization, in which denominations such as "cliffs", "beach" and "drains" emerge. This change not only implies greater descriptive precision but also a reconfiguration of the way nature is valued, with an apparently greater centrality of the environment.

In general terms, the semantics with which urban nature is recognized over time are associated with social and environmental values. However, this configuration is altered in its regulatory translation, in which the economic, social, and environmental value emerges equally. This evidences a process of concealment about the final meaning that is given to the territory, where areas with environmental value, such as cliffs or beaches, in practice, end up transforming into spaces with an economic destination that promotes cultural, commercial, and tourist uses, which strain their original meaning (Figure 3).

In the first period, the few recognized natural areas have broad designations such as “parks and separations” and “forest parks”, which are interpreted semantically as socially functional and productive. However, in its regulatory translation, land uses move from an environmental language to a generic one. This regulatory irregularity facilitated practices such as forest monoculture, which evidences an instrumentalization of nature.

In the second period, categories such as “ecological protection areas” are incorporated, explicitly introducing an environmental value of “conservation” into the semantic discourse, while others, such as “recreation areas,” consolidate the social-recreational character of the previous period. However, this differentiation is diluted in the regulatory discourse, where environmental zones admit a variety of uses such as tourism, housing, and equipment, which prevent conservation, making what is semantically regulated as environmental more flexible.

In the third period, there is a significant increase in both the number of natural areas and the specificity of their designations (“cliffs”, “beaches”, or “drains”), reflecting a greater technical recognition of urban nature. Nevertheless, this semantic expansion does not translate into more effective protection, since areas with environmental value continue to be oriented towards economic uses linked to urban development. In contrast, the areas with a social character maintain coherence between the two dimensions, which evidence an asymmetry in the translation of values (Table 4).

In summary, metropolitan planning makes a persistent gap between semantic and regulatory discourse evident. The natural areas of an environmental character in the semantic discourse are largely transformed into areas of economic exploitation. However, those areas recognized as social value remain constant across both discourses. These results suggest that, despite the rise of environmental and social discourse, there are still natural areas available to support productive activities associated with ports, infrastructure, and the installation of different

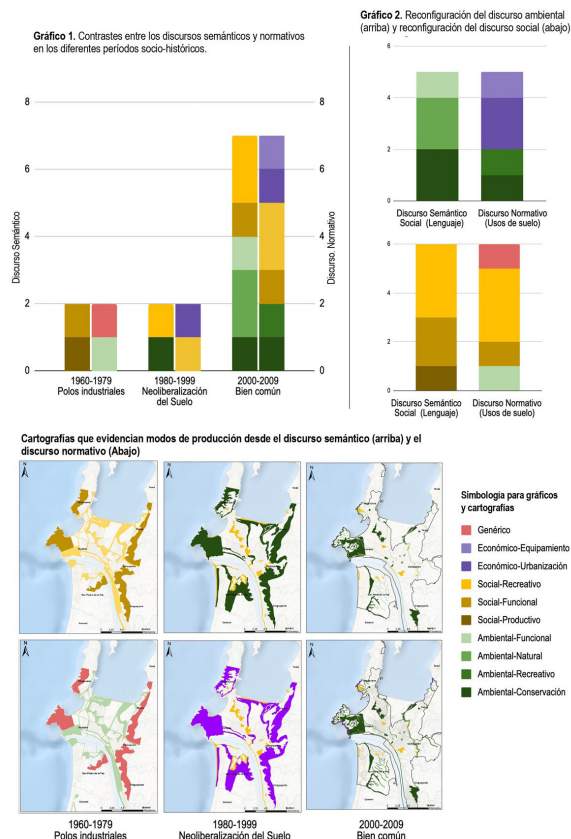


Figure 3. Graphs and cartographies of contrasts between semantic and regulatory discourses in different socio-historical periods at the metropolitan scale. Source: Prepared by the authors.

equipment. Urban development on natural spaces validates metropolitan expansion processes through designations and regulatory categories that attenuate and make invisible the territorial impacts associated with such transformations.

Contrasts between the semantic and regulatory discourses of nature production in the communal planning instruments

At the communal planning level, across different periods, 93 areas associated with nature were identified. In general terms, there are discrepancies between semantic and regulatory discourses. While the former tends to name these areas primarily in terms of environmental values, the latter regulates them primarily through social and, in some cases, economic functions (Figure 4).

In the first period, natural areas are recognized under categories such as “green areas”, “free areas”, or

Modes of production	1960-1979		1980-1999		2000-2009	
	Semantic	Regulatory	Semantic	Regulatory	Semantic	Regulatory
Generic	-	50%	-	-	-	-
Economic-Recreational	-	-	-	-	-	-
Economic-Equipment	-	-	-	-	-	14%
Economic-Urbanization	-	-	-	50%	-	14%
Economic-Productive	-	-	-	-	-	-
Social-Productive	50%	-	-	-	-	-
Social-Equipment	-	-	-	-	-	-
Social-Functional	50%	-	-	-	14%	14%
Social-Recreational	-	-	50%	50%	29%	29%
Environmental-Restriction	-	-	-	-	-	-
Environmental-Functional	-	50%	-	-	14%	-
Environmental-Natural	-	-	-	-	29%	-
Environmental-Recreational	-	-	-	-	-	14%
Environmental-Conservation	-	-	50%	-	14%	14%

Table 4. Percentages of modes of nature production in the different historical periods on a metropolitan scale. Source: Prepared by the authors.

“afforestation”, which configure a semantics associated with an environmental-conservation and environmental-recreational character. However, this orientation loses force in its regulatory translation, since the admitted uses acquire a social-recreational or even generic character, as evidenced by a weak correspondence between the declared environmental valuation and its regulatory materialization.

During the second period, the use of generic designations to identify natural areas predominates, such as “sector 5” or “sector 6”. This semantics evidences an invisibilization of nature as an explicit category of planning. However, in regulatory discourse, these areas acquire an environmental character oriented towards conservation, indicating that the environmental dimension is not only constructed through language but also emerges from regulation.

In the third period, the greatest number and diversity of natural areas are concentrated, which accounts for greater specificity in recognizing the natural. However, this greater semantic specificity associated with environmental values, at the regulatory level, is oriented towards other urban functions. In the fourth period, a semantic discourse associated with environmental conservation and restriction is consolidated and interpreted as the result of the institutionalization of sustainability in urban planning. However, the inconsistency mentioned in the previous periods persists (Figure 4 and Table 5).

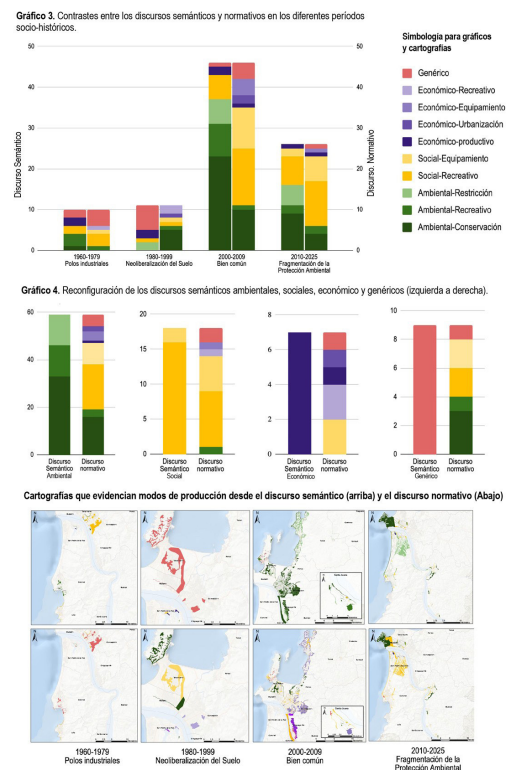


Figure 4. Graphs and cartographies of contrasts between semantic and regulatory discourses in different socio-historical periods at the communal scale. Source: Prepared by the authors.

Modes of production	1960-1979		1980-1999		2000-2009		2010-2025	
	Semantic	Regulatory	Semantic	Regulatory	Semantic	Regulatory	Semantic	Regulatory
Generic	20.0%	40.0%	54.5%	-	2.2%	8.7%	-	3.8%
Economic-Recreational	-	10.0%	-	18.2%	-	-	-	-
Economic-Equipment	-	-	-	-	-	8.7%	-	3.8%
Economic-Urbanization	-	-	-	9.1%	-	4.3%	-	-
Economic-Productive	20.0%	-	18.2%	-	4.3%	2.2%	3.8%	3.8%
Social-Productive	-	-	-	-	-	-	-	-
Social-Equipment	-	10.0%	-	9.1%	-	21.7%	7.7%	23.1%
Social-Functional	-	-	-	-	-	-	-	-
Social-Recreational	20.0%	30.0%	9.1%	9.1%	13.0%	30.4%	26.9%	42.3%
Environmental-Restriction	-	-	18.2%	-	13.0%	-	19.2%	-
Environmental-Functional	-	-	-	-	-	-	-	-
Environmental-Natural	-	-	-	-	-	-	-	-
Environmental-Recreational	30.0%	10.0%	-	9.1%	17.4%	2.2%	7.7%	7.7%
Environmental-Conservation	10.0%	-	-	45.5%	50.0%	21.7%	34.6%	15.4%

Table 5. Percentages of modes of nature production in the different historical periods on a communal scale. Source: Prepared by the authors.

The areas called “landscape protection”, “special protection of slopes”, “protection of natural value resources of cliffs” and “landslide restriction” have categories associated with environmental protection or territorial restriction; however, they allow land uses linked to housing, hotels, and equipment. This shows a divergence between the semantic discourse of protection and the effective regulation of the territory, creating a recurring pattern in which the semantic discourse emphasizes ecological or protective values. In contrast, the regulations permit urbanization and the installation of infrastructure and equipment.

Dominant modes of production

The analytical categories of value and function show that the modes of production of nature in the urban planning of the Metropolitan Area of Concepción do not operate in isolation, but are shaped by the overlap and tension among environmental, social, economic, and generic values. Although an environmental and social assessment of nature predominates at the semantic level, associated with conservation and recreation functions, its regulatory

translation implements a mode of producing a social character that reorients these spaces towards logics of well-being and social cohesion, thereby weakening their conservation. On the other hand, the persistence of generic categories over time reflects a tactical ambiguity in urban planning that facilitates the flexibility and adaptation of nature to other rationalities of land use, thereby reducing its meaning. This systematic mismatch suggests that nature is discursively recognized in order to reconfigure it materially for other purposes.

VI. DISCUSSION

The results obtained allow us to interpret that urban planning is not only a technical regulatory instrument but also a discursive device that orients the production and transformation of nature. The systematic gap between semantic and regulatory discourse shows that the production of nature is mediated by power relations, as proposed by Shirazi (2023) and Bourdieu (1991). This divergence, far from being a technical inconsistency, demonstrates a structural

logic in which the discursive recognition of nature does not necessarily translate into its effective protection. This shows how environmental representations of nature not only seek to protect but also conceal urban transformation logics oriented towards economic interests (Smith, 2020; Swyngedouw, 2011).

The modes of production also reveal a hidden hierarchy of values. Although planning is usually considered a space for balanced articulation among environmental, social, and economic dimensions (Valencia-Sandoval et al., 2010), these results show that this integration does not materialize symmetrically in territorial regulation. Instead, a hierarchy of values is established that favors certain productive and recreational logics, generating processes of exclusion in which forms of nature that do not conform to these rationalities are rendered invisible or subordinated (Van Speybroeck & Targa, 2026). In contrast, generic categories introduce ambiguity in regulation, facilitating the installation of institutional discourses and technical and legal regulations that can lead to unforeseen spatial practices (Blomley, 2023).

Language plays a key role in this process. Categories such as "green areas" reduce the ecological complexity of the territory by omitting specific qualities and facilitating their reinterpretation in different regulatory contexts (Reyes-Paecke & De la Barrera Malgarejo, 2019; De la Barrera et al., 2023). This limits the possibility of recognizing the complexities of the human-nature relationship within the urban environment (Van Speybroeck & Targa, 2026), where planning can be understood as a simplification technique that makes the territory legible, reduces its diversity and enables its transformation.

The results are consistent with other cases in Latin America, where urban planning operates under tensions between sustainability discourses and practices oriented to exclusive economic development (Escobar, 2015). The institutionalization of environmental discourse on natural areas does not guarantee their protection, as they remain exposed to intense urbanization. This reinforces the idea that language not only describes space but also classifies and organizes it by producing hegemonies over it (Foucault, 1977).

This observation is deepened between the different scales of planning. While at the metropolitan scale, there is a tendency to construct a more abstract and environmentally oriented discourse, at the communal scale, this translates into regulations that intensify the urbanization of natural areas. This suggests that the production of nature depends not only on the values attributed, but also on the level at which they operate.

Although recent literature highlights the role of citizenship in generating urban knowledge by proposing alternative ways

of understanding and producing nature that have not yet been incorporated into planning instruments (Bonhoure et al., 2026), the results indicate that institutional instruments mediate the production of urban nature.

The findings presented allow us to argue that urban planning not only organizes the relationship between the city and nature but also redefines its meaning and function by producing a nature that is simultaneously recognized as an environmental value and as a resource for urban development. This proposes that planning fixes certain representations of nature while omitting others present among territorial actors. One of the limitations of the research lies in focusing on the institutional discourses contained in the planning instruments, without incorporating socio-economic variables or delving into the perceptions and disputes of other territorial actors. However, the results suggest that regulatory transformations could be associated with differentiated processes of territorial valorization, opening future lines of research that incorporate community and private perspectives on nature production and analyze the relationship between urban planning and socio-spatial inequality across different modes of nature production.

VII. CONCLUSIONS

The AMC exhibits a changing socio-historical trajectory in the recognition of nature, marked by increasing sophistication in the language used and in the environmental and social values it entails. However, its recognition is limited to the discursive plane, since it is not transformed into specific regulations. In practice, the regulation of nature primarily focuses on social and economic functions.

This inconsistency confirms that the naming of areas in urban planning not only serves a descriptive role but also reconfigures nature. The categories used to name it not only reflect certain visions but also enable or restrict specific forms of intervention. Language operates as a mechanism that obscures urban transformation processes, in which the environment functions as a discursive layer that does not necessarily translate into the effective protection of nature. Through language, urban planning produces nature under different rationalities in which the economic and social are hierarchized, overlapping with the environmental.

This way of producing nature is expressed differently across planning scales. While at the metropolitan level, the definition of zoning is dominated by an abstract, environmental semantic language that recognizes nature, at the communal level, regulatory languages predominate, privileging social and economic functions to define land

uses. This denotes a strategic adaptability between what is named and the norm.

From a methodological perspective, the contrast between semantic and normative discourse enables the systematic and replicable visibility of the consistencies and discrepancies that arise in urban planning between what is declared and what is regulated. This can contribute to improving understanding of the legal structure on which the current socio-environmental conflicts that emerge in Chilean cities arise and develop, opening the possibility of looking more closely at the role of discourses in disputes over the meaning and use of nature in urban contexts.

Finally, the findings underscore the need to move towards urban planning instruments that are more consistent with the recognition and protection of nature, and that question the use of generic categories or "environmental makeup" that mask territorial decisions that do not aim at its protection.

VIII. CONTRIBUTION OF AUTHORS CRediT:

Conceptualization, C.C.; Data curation, C.C.; Formal analysis, C.C.; Acquisition of financing, F.D.B.; C.C.; M.F.; Research, C.C.; Methodology, C.C.; F.D.B.; M.F.; Project management, X.X.; Resources, X.X.; Software, X.X.; Supervision, F.D.B.; Validation, X.X.; Visualization, C.C.; Writing - original draft, C.C.; M.F.; F.D.B.; Writing - revision and editing, C.C.; M.F.; F.D.B.

IX. BIBLIOGRAPHIC REFERENCES

Beatley, T. (2011). *Biophilic cities: Integrating nature into urban design and planning*. Island Press.

Blomley, N. (2023). *Territory: New trajectories in law*. Routledge.

Bonhoure, I., Guba, B., Peer, C., Labastida, I., & Perelló, J. (2026). Citizen science contributions to sustainable urban transformation, urban sustainability and urban planning: A systematic literature review. *Cities*, 174, 107056. <https://doi.org/10.1016/j.cities.2026.107056>

Bourdieu, P. (1991). *Language and symbolic power*. Polity Press. https://monoskop.org/images/4/43/Bourdieu_Pierre_Language_and_Symbolic_Power_1991.pdf

De La Barrera, F., Reyes-Paecke, S., Truffello, R., De La Fuente, H., Salinas, V., Villegas, R., & Steiniger, S. (2023). Comparing green spaces provision and accessibility indicators over a latitudinal gradient and multiple climate zones. *Urban Forestry & Urban Greening*, 79, 127791. <https://doi.org/10.1016/j.ufug.2022.127791>

Reyes-Paecke, S., & De La Barrera Melgarejo, F. (2019). Monitoreo de los avances en desarrollo urbano: análisis de los catastros de áreas verdes urbanas en el Área Metropolitana de Santiago, Chile. *Revista INVI*, 34(96), 129-150. <http://dx.doi.org/10.4067/S0718-83582019000200129>

Escobar, A. (2010). *Territorios de diferencia: Lugar, movimientos, vida, redes*. Envió Editores.

Escobar, A. (2015). Territorios de diferencia: La ontología política de los "derechos al territorio". *Cuadernos de Antropología Social*, (41), 25-38. <https://revistascientificas.filo.uba.ar/index.php/CAS/article/view/1594>

Fairclough, N. (1992). *Discurso y cambio social*. Cambridge, Polity Press.

Foucault, M. (1977). *Vigilar y castigar: Nacimiento de la prisión* (trad. A. Fontana). Siglo XXI Editores.

Gehl, J. (2011). *Life between buildings: Using public space* (6th ed.). Island Press.

González Redondo, C. (2024). El análisis del discurso para abordar la dimensión simbólica del espacio urbano. *Cuaderno Urbano. Espacio, Cultura y Sociedad*, 39(39), 33-52. <https://doi.org/10.30972/crn.39397892>

Harvey, D. (1982). *The limits to capital*. Basil Blackwell.

Harvey, D. (1996). *Justicia, naturaleza y la geografía de la diferencia*. Blackwell Publishers.

Hidalgo, R., Vergara-Constela, C., & González-Rodríguez, M. (2022). Las condiciones de la urbanización y la producción de naturaleza en ciudades litorales chilenas. Los casos de Valparaíso y Coquimbo. *Revista EURE-Revista de Estudios Urbano Regionales*, 48(145), 1-24. <https://dx.doi.org/10.7764/eure.48.145.03>

Jacobs, J. (2014). *Muerte y vida de las grandes ciudades*. Praxis

Leff, E. (2004). *Racionalidad ambiental: La reapropiación social de la naturaleza*. Siglo XXI editores.

Lefebvre, H. (2014). *La producción del espacio*. Praxis.

McHarg, I. (1969). *Proyectar con la naturaleza*. Gustavo Gili.

Merchant, C. (2023). *La muerte de la naturaleza: Mujeres, ecología y revolución científica*. Siglo XXI editores.

Mignolo, W. (2012). Decolonizing Western epistemology / building decolonial epistemologies in A. M. Isasi-Díaz & E. Mendieta, *Decolonizing epistemologies: Latina/o theology and philosophy*. Fordham University Press. <https://doi.org/10.5422/fordham/9780823241354.003.0002>

Nicolás-Artero, C., Fuster-Farfán, X., & Velut, S. (2021). Introducción. Disputada, apropiada y desposeída: la naturaleza en las ciudades latinoamericanas. *Cahiers des Amériques latines*, 97. <https://doi.org/10.4000/cal.13089>

Reclus, E. (1875). La tierra y los hombres. *Revista Europea*, 4(70), 663-664. <http://www.filosofia.org/rev/reu/1875/n070p663.htm>

Santos, M. (1978). *Por uma Geografia Nova: Da Crítica da Geografia a uma Geografia Crítica*. Editorial Edusp.

Scott, J. C. (1998). *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press.

Shirazi, M. R. (2023). Discourse studies and urban research: Methodological challenges, achievements, and future prospects. *Urban Science*, 7(2), 42. <https://doi.org/10.3390/urbansci7020042>

Smith, N. (2007). Nature as accumulation strategy. *Socialist Register*, 43, 16-36. <https://socialistregister.com/index.php/srv/article/view/5856>

Smith, N. (2020). *Desarrollo desigual, naturaleza, capital y la producción del espacio*. Traficantes de sueños.

Swyngedouw, E. (2011). ¡La naturaleza no existe! La sostenibilidad como síntoma de una planificación despolitizada / Nature does not exist! Sustainability as Symptom of a Depoliticized Planning. *Urban*, (01), 41–66. <https://polired.upm.es/index.php/urban/article/view/410>

Valencia-Sandoval, C., Flanders, D. N., & Kozak, R. A. (2010). Participatory landscape planning and sustainable community development: Methodological observations from a case study in rural Mexico. *Landscape and Urban Planning*, 94(1), 63–70. <https://doi.org/10.1016/j.landurbplan.2009.07.018>

Van Speybroeck, K., & Targa, J. (2026). Contested natures in the city: rewilding, othering and more-than-human perspectives. *Urban Geography*, 1–23. <https://doi.org/10.1080/02723638.2026.2622654>

Villagra Islas, P. (2011). Leonel Pérez y Rodrigo Hidalgo (eds.). Concepción metropolitana: evolución y desafíos. *Revista de Geografía Norte Grande*, (48), 179-182. <https://dx.doi.org/10.4067/S0718-34022011000100010>

Von Mentz, B. (Coord.). (2012). *La relación hombre - naturaleza. Reflexiones desde distintas perspectivas disciplinarias*. Siglo XXI Editorial.

Waldheim, C. (2016). *Landscape as Urbanism. A general theory*. Princeton University.

Walsh, C. (2007). Interculturalidad y Colonialidad del Poder. Un pensamiento y posicionamiento "otro" desde la diferencia colonial en S. Castro-Gómez y R. Grosfoguel (Eds.), *El giro decolonial. Reflexiones para una diversidad epistémica más allá del capitalismo global* (pp.47-62). Siglo del Hombre Editores.

Zazo-Moratalla, A., Orellana-Mcbride, A., & Cerda-Inostroza, C. (2023). Agricultura urbana en barbecho. Concepciones en la planificación urbana chilena. *Revista EURE - Revista de Estudios Urbano Regionales*, 49(147), 1-25. <https://dx.doi.org/10.7764/eure.49.147.06>

X. ACKNOWLEDGMENTS

We thank all the participants in this research for their time, willingness, and valuable collaboration, which made this study possible.

